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The Commonwealth of Massachusetts

ANNUAL REPORT

OF THE

METROPOLITAN DISTRICT COMMISSION

FOR THE YEAR 1933



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REPORT OF THE METROPOLITAN DISTRICT COMMISSION

To the Honorable the Senate and House of Representatives of the Commonwealth of Massachusetts in General Court assembled.

The Metropolitan District Commissioner has already presented to your Honorable Body an abstract of the account of the receipts, expenditures, disbursements and liabilities of the Metropolitan District Commission for the fiscal year ending on November 30, 1933, and now, in accordance with the provisions of section 100 of chapter 92 of the General Laws, presents a detailed statement of its doings for the calendar year ending on December 31, 1933.

FOURTEENTH ANNUAL REPORT

I. Organization and Administration

COMMISSION, OFFICERS AND EMPLOYEES

William F. Rogers, whose term of office expired November 30, 1932, was reappointed November 8, 1933. Charles H. J. Kimball died February 18, 1933 and Felix A. Marcella was on March 9, 1933 appointed to fill the vacancy for the unexpired term of office until November 30, 1933, and was again appointed December 27, 1933 for the succeeding term of office. George B. Wason died October 14, 1933, and Joseph B. Jacobs was on November 8, 1933 appointed to fill the vacancy. Both Mr. Wason and Mr. Kimball had given able and valuable service as Associate Commissioners, Mr. Wason since January 1921, and Mr. Kimball since December 1928. The membership of the Commission was at the end of the year: Davis B. Keniston, Commissioner, William F. Rogers, Melvin B. Breath, Felix A. Marcella and Joseph B. Jacobs, Associate Commissioners.

William E. Whittaker has continued as Secretary of the Commission, William E. Foss as Director and Chief Engineer of the Water Division. Frederick D. Smith continued as Director and Chief Engineer of the Sewerage Division until his retirement on November 9, 1933. Mr. Smith had been continuously employed in the engineering forces of the Metropolitan Sewerage Works since his appointment June 1, 1893. He had served as Chief Engineer since May 1916, and as Director and Chief Engineer of the Sewerage Division since December 3, 1919. His ability and experience as an engineer in the construction of sewerage works was recognized and he had an enviable record as a capable and efficient director. At the end of the year no one had been appointed to this position. Benjamin R. Davis was on January 31, 1933 appointed as Director and Chief Engineer of Park Engineering.

The maximum number of employees during the year was 1,675, divided as follows: general offices, 53; parks 949; water, 417; sewerage, 256.

II. General Financial Statement

Year ending November 30, 1933

Expended for construction	\$1,174,572.82
Expenditures, miscellaneous	196,682.73
Expenditures for maintenance	4,004,773.90
Total expenditures	5,376,029.45
Unexpended balance, maintenance appropriations	765,369.64
Serial bonds and notes issued	300,000.00
Serial bonds and notes paid	649,937.50
Increase in sinking funds	2,302,451.19
Decrease in net debt	2,652,388.69

On November 30, 1932

Net debt	\$24,098,153.86
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III. Construction

The last section of the New Neponset Valley Sewer, Section 121, started in 1932 extending from Washington Street, Canton to the Canton-Stoughton

town line was completed in June. The towns of Norwood, Walpole and Canton have made connections with the sewer, but no connection has as yet been made by the town of Stoughton.

The remaining uncompleted sections of the Braintree-Weymouth sewer were all completed during the year with the exception of a small amount of incidental work on Section 124. The pumping station near the High Level sewer in the Adams Shore section of Quincy has been built, the pumping equipment installed and the connection for the sewer for the Adams Shore section has been built under the high level sewer. This pumping station will serve the Braintree-Weymouth extension and the Adams Shore section of Quincy. The towns of Braintree and Weymouth were notified on December 6 that the sewer was ready for use and on December 11 connection was made by the town of Braintree.

The High Level Sewer extension from Oak Square, Brighton to the Newton city line started in 1932, was completed August 28 and opened for service for the City of Newton.

The extension of the Mill Brook Valley sewer from Park Street, Arlington, to the Lexington line was authorized by Chapter 281 of the Acts of 1933. Work was started in July and by the end of the year 2,226 feet of pipe out of the total length of 2,510 feet had been laid. The line should be completed early in the coming year.

The installation of the two new additional pumping units at the Chestnut Hill Station started in 1932, was completed during the year, and the suction and discharge pipes, valves and meters connected.

A contract was let in July for the extension of the Weston Aqueduct supply main by a 60-inch steel pipe from Boston Avenue in Somerville near the Medford line across the Mystic River and through the Mystic River Reservation to Governors Avenue, Medford, 5,000 feet in length. At the end of the year 3,840 feet of pipe had been laid.

The extension of the Northern High Service Pipe Line from Ocean Avenue near Revere Street in Revere, to Broad Street at Washington Street in Lynn, 21,500 feet in length, was started during the year. The pipe 20 inches in diameter for the entire distance was purchased. The laying of the pipe from Ocean Avenue to the Saugus River was completed and 5,678 feet of the 7,950 feet of pipe from the northerly side of the river to Broad Street had been laid when the work was suspended in December for the winter. The steel pipe for the connection across the river and under the channel of the river has been purchased and the pipe will be laid in conjunction with the construction of the new Saugus River bridge.

There were purchased 48 screw lift water valves varying in size from 12 to 36 inches in diameter for use on pipe line extensions.

The contract started in 1932 for the grading, loaming and shore protection of the section of the Charles River Embankment from Longfellow bridge to the Union Boat Club, including the masonry steps at the Boat Haven, was completed during the year. The filling of the entire additional areas from the dam to Cottage Farm bridge was completed early in the year and the work of grading, loaming, shore protection, landings, the masonry at the overlooks and the bridges at both ends of the lagoon, were let during the first half of the year. This work was divided into three contracts. The contract for the work between the dam and Longfellow bridge, including the breakwater at the Boat Haven, was completed during the year. The remainder of the work was largely completed, some work being required around the overlooks and some further grading and loaming. The entire work under these contracts should be completed during the spring.

The following contracts in the Parks Division started in 1932 were completed during the year:

Widening and reconstruction of Paul's Bridge at East Milton Street, Boston and Milton Street, Milton.

Traffic Control signals, Old Colony Parkway.

Excavating and filling to subgrade Mystic Valley Parkway, from Revere Beach Parkway to Mystic Avenue at Harvard Street, Medford.

The following contracts for construction in the Parks Division were awarded and completed during the year:

Charles River Road extension from Western Avenue to North Beacon Street, Brighton.

Hammond Pond Parkway from Boylston Street to Beacon Street, Newton, with bridge over the tracks of the Boston and Albany Railroad.

The bathing beach and bath house on the easterly bank of "Labor in Vain" between Mystic River and Riverside Avenue, Medford.

Shore protection at Nahant from the bath house to near Wilson Road.

The following boulevards and parkways were resurfaced during the year with some changes in grade and alignment:

Blue Hill River Road, Milton and Quincy, from Randolph Avenue to Hillside Street; Fellsway East, Malden, from Highland Avenue to Savin Street; Fellsway West, Medford, from Salem Street to Wicklow Street, inbound roadway; Lynn Fells Parkway, Melrose, from near Vinton Street to Melrose Street; Mystic Valley Parkway, Winchester from Highland Avenue to Middlesex Fells Reservation; Mystic Valley Parkway, Somerville and Medford, from Boston Avenue to Auburn Street; Soldiers Field Road, Boston from Telford Street for 4,100 feet easterly; Ravine Road, Stoneham, and North Beacon Street Bridge with the approach on the westerly end, was resurfaced.

Extensive repairs were made to the roof of the bath house at Revere and to the subway connection to the beach from the women's section.

Changes were made in the alignment of Revere Beach Parkway near Railroad Street, Revere, and a section of the easterly roadway was resurfaced.

A traffic circle was constructed in conjunction with the City of Boston at the junction of West Roxbury Parkway and Brook Farm Parkway.

A contract was let late in the year for the construction of a bridge with a draw over the Mystic River for the new section of Mystic Valley Parkway, between Mystic Avenue and Revere Beach Parkway.

IV. Parks and Reservations

The usual work of maintenance and upkeep of the reservations, parkways and boulevards has been continued during the year. An appropriation of \$75,000 was made available about the first of April for the relief of the unemployed, and a maximum of 850 men for three days a week were employed during the succeeding four months for cutting brush, clearing woods and other miscellaneous work in the reservations.

In the latter part of June a Civilian Conservation Camp was established by the National Park Service for Emergency Conservation Work for State Parks in the Blue Hills Reservation near Randolph Avenue. The camp was in charge of U. S. Army Officers. The enlisted men in the camp varied from 212 to 145. The work of the men in the reservation has been handled by a civilian supervisor and eight foremen. Up to the end of the year 13 miles of telephone police signal lines had been repaired and put in order, 3 miles of roadside cleared of brush and fallen trees for fire protection, over 400 acres of forest cleared and improved, about 5 miles of service roads, bridle paths and fire breaks, and over 2 miles of foot paths built; some seven acres had been cleared and improved as picnic grounds with stone fireplaces and tables; over 1300 acres have been inspected for gypsy moth control and some 61,000 nests creosoted; and several new parking areas have been developed and old areas improved.

In November Federal Funds were made available for the relief of the unemployed under the Civil Works Administration, and twenty-nine projects were approved authorizing the employment for thirty hours a week until February 15, 1934, of about twenty-eight hundred men.

One hundred and twenty-one band concerts were given during the summer months in the various parks and reservations at a cost of \$19,978.72. The Symphony Concerts were again conducted by Mr. Arthur Fiedler on the

Esplanade for about three weeks during July and August, sixteen concerts being given.

The golf courses at Riverside and Ponkapoag were both well patronized during the playing season. The full eighteen hole course at Ponkapoag was ready for use at the beginning of the season. At Riverside over 25,000 rounds of golf were played and at Ponkapoag over 27,000 rounds.

In the Revere Beach Division the severe storms of January 27, combined with high tides, caused substantial damage to the sea-walls and shore protection at Winthrop, Revere and Nahant and threw up a large quantity of sand, rocks and other debris onto the boulevards. The material was removed and extensive repairs made to the walls and shore protection.

The sanitary at Wilson Road, Nahant, has been completed. The lawn at Red Rock on Lynn Shore has been replanted to maples, replacing the oaks which previously were planted and had died. Curbing was set for about 8,000 feet on both sides of the Revere Beach Parkway between County Road and Second Street. Improvements were made to the ball field and playground at Nahant.

In the Middlesex Fells Division the channel of Spot Pond brook above Lynn Fells Parkway has been improved by the building of several small pools with well defined and attractive shores, and a new path has been built with attractive stone bridges where it crosses the brook. Both the paint shop and carpenter shop have been enlarged and some new wood working machinery installed in the carpenter shop. In the Zoo a new drain has been laid, the cages in the monkey house have been provided with glass doors, and a guard rail. A new root cellar has been built. The loam spaces at the circle at Forest and Main Streets have been graded and loamed, and considerable planting done along Alewife Brook.

The Magazine Beach bath house in Cambridge was remodeled and renovated. The shore between Magazine Beach and Boylston Street on the Cambridge side was reshaped and rip-rapped where it had been washed out. About 200 feet of edge stone was set at the fork of the road on Memorial Drive.

Some additional filling was made on the marsh area on the westerly side of Soldiers Field Road, north of the Speedway. The speedway track was resurfaced with clay and a new cinder path built around the show ring. Some grading and planting was made around the Boston end of the John W. Weeks bridge. A new concrete walk was built at the northerly corner of Larz Anderson bridge, and curbing set on Soldiers Field Road between the Newell boat house and John W. Weeks bridge. The bridge at Woerd Avenue, Forest Grove, was rebuilt. The parking space and grounds at Beaver Brook reservation have been improved. A new caddy house, and garage, have been built at the Riverside Golf Course, the entrance road widened and Norway Maples planted.

Surface treatments were applied to Unquity Road, West Roxbury Parkway between Washington and Centre streets, and between Weld and Hammond streets and on Quincy Shore Reservation between Squantum Street and Neponset Bridge. A building formerly owned by the city of Boston and included in the area acquired for Brook Farm Parkway was fitted up as a garage and police sub-station.

At Nantasket a new roof was built on the boiler room and the roof of the waiting room repaired. New concrete foundations and sea-wall were built under the hotel, and new walks built from the hotel to Tivoli Shelter and along the south parking yard. The buildings, where required, have been thoroughly repaired and painted.

V. Police

The permanent police force has remained substantially the same during the year, the force at the end of the year consisting of one Captain and Executive Officer, 4 captains, 6 lieutenants, 18 sergeants, 159 patrolmen, 1 policewoman, a total of 189, one vacancy as captain being unfilled.

Edward M. Woods has continued as Captain and Executive Officer.

During the year 1 captain and 2 sergeants have died, 2 captains were retired, 1 officer resigned and 1 officer was discharged. Two lieutenants have been promoted to captains, two sergeants promoted to lieutenants, four patrolmen promoted to sergeants, and 6 officers appointed. Thirty call officers and one policewoman were appointed to serve during the summer months in addition to the regular force.

During the year 3,136 cases were handled by the department before the courts, and 2,414 accidents were reported. The members of the force performed 5,423 hours of extra duty without additional compensation. Seven officers were commended by the commission for meritorious conduct.

During January and February two days each week, the department was drilled in accordance with infantry regulations of the United States Army and received lectures on criminal law.

The morale and discipline of the Department has been excellent.

VI. Rainfall and Consumption of Water.

The rainfall and yield of the watersheds was above the average during the year, the rainfall in the Wachusett watershed being nearly six inches above the average for the past 37 years, and in the Sudbury watershed nearly three inches. Wachusett Reservoir at the beginning of the year was less than two feet below normal high water line; it filled and overflowed during the spring and at the end of the year was drawn down a little more than six feet. No water was diverted from the Ware River during the year.

The consumption of water from the Metropolitan Water Works during the year by the 18 municipalities regularly supplied was 45,652,017,000 gallons, equivalent to an average daily consumption of 125,074,000 or 87. gallons per capita for the estimated population of 1,438,440 in the district supplied, a decrease over the previous year of nearly three million gallons per day and three gallons per capita per day.

VII. Special Investigations

In accordance with the provisions of Chapter 10 of the Resolves of 1933 the Commissioner of Conservation, the Commissioner of Public Health and the Metropolitan District Commissioner made an investigation and study, and reported relative to the use of certain lands and waters in the Commonwealth for recreational purposes.

In accordance with the provisions of Chapter 12 of the Resolves of 1933 the Commission investigated and reported relative to the advisability of establishing an adequate auxiliary water supply for communities supplied with water from the Spot Pond Reservoir.

In accordance with the provisions of Chapter 15 of the Resolves of 1933 the Department of Public Health and the Metropolitan District Commission, acting as a joint board, investigated and reported relative to improving Spot Pond Brook in the town of Stoneham and the cities of Melrose and Malden.

In accordance with the provisions of Chapter 20 of the Resolves of 1933 the Commission investigated and reported relative to the advisability of constructing a beach on the Malden River in the City of Everett, and of constructing and maintaining a bath house thereat.

VIII. Other Reports

The reports of the Directors of Park Engineering, Water and Sewerage, with tables, statistics and financial statements, are hereto appended.

Respectfully submitted,

DAVIS B. KENISTON,
Metropolitan District Commissioner.

February 28, 1934.

REPORT OF THE DIRECTOR OF PARK ENGINEERING

HON. DAVIS B. KENISTON, *Commissioner, Metropolitan District Commission.*

Dear Sir:

The following report of the work done under the direction and supervision of the engineering department of the parks division during the year ending December 31, 1933, is respectfully submitted.

ORGANIZATION

The engineering force has averaged as follows: one director of park engineering, one associate civil engineer, one supervisor of machinery and equipment, one superintendent of locks and drawbridges, six assistant civil engineers, eleven junior civil engineers, one senior engineering draftsman, one inspector of construction, sixteen senior engineering aids, fifteen junior engineering aids, one foreman of garage and chauffeur, four stenographers, one plan clerk, and forty-nine lock and drawbridge assistants, mechanicians, operators, and helpers.

All construction work and the general direction and supervision of all maintenance and repairs of parkways and boulevards, bridges, buildings and structures in the various park divisions, and the operation of the various drawbridges and locks are in charge of the engineering department.

CONSTRUCTION AND MAINTENANCE WORK

The following construction work started during 1932 was completed in 1933:

Widening and reconstructing Paul's Bridge and approaches over the Neponset River at East Milton Street, Boston, and Milton Street, Milton, as authorized by chapter 460 of the acts of 1931 and chapter 170 of the acts of 1932.

Traffic control signals, Old Colony Parkway.

Excavating, filling, grading, surfacing, and shore protection, concrete and granite masonry and boat landing southerly from Longfellow Bridge, Charles River Basin, Boston.

Excavating and filling to subgrade Mystic Valley Parkway from Revere Beach Parkway to Mystic Avenue at Harvard Street, Medford.

During the year plans and specifications have been prepared and construction supervised on the following work done by contract or by the maintenance forces of the various divisions.

CHARLES RIVER BASIN

Widening and extension of Boston Embankment. A contract was let for excavating, filling, grading, surfacing, and shore protection, between the Dam and Longfellow Bridge, and a breakwater opposite Pinckney Street, Boston, and this work was done by Coleman Brothers, Corporation.

A contract has been let for excavating, filling, grading, shore protection, boat landings, and concrete and granite masonry overlooks and bridges, Charlesgate East to Mt. Vernon Street, Boston, and the work is being done by Coleman Brothers, Corporation.

A contract has been let for excavating, filling, grading, loaming, gravel walks, shore protection, and boat landing, Cottage Farm Bridge to Charlesgate West, Boston and Brighton, and the work is being done by Coleman Brothers, Corporation.

CHARLES RIVER RESERVATION

A contract was let and work was completed for constructing a roadway from North Beacon Street to Western Avenue, Boston, (Brighton District). The work was done by the M. McDonough Co.

HAMMOND POND PARKWAY

A contract was let for constructing Hammond Pond Parkway, Boylston Street to Beacon Street, Newton, and bridge over the Boston and Albany Railroad. The work was done by the M. McDonough Co. and has been completed.

MIDDLESEX FELLS RESERVATION

Ravine Road, Stoneham, was constructed by A. G. Tomasello and Son Inc.

MYSTIC RIVER RESERVATION

A bathing beach was constructed on the easterly bank of "Labor-in-Vain," Medford, and the work was done by the M. McDonough Co.

A contract was let for constructing a bathhouse on the easterly bank of "Labor-in-Vain" between the Mystic River and Riverside Avenue, Medford. The work was done by the Tenaglia Construction Co. and has been completed.

MYSTIC VALLEY PARKWAY

A contract has been let for constructing a bridge over the Mystic River between Mystic Avenue and Revere Beach Parkway, Medford. This structure is to be of steel girder construction, with concrete and granite masonry piers and abutments, and a double leaf trunion type draw. The work of construction is being done by Coleman Brothers, Corporation.

NAHANT BEACH PARKWAY

Shore protection was constructed by A. G. Tomasello & Son, Inc., from Nahant Bathhouse to near Wilson Road, Nahant.

A contract was let for constructing a sewer connecting the Nahant Bathhouse with the City of Lynn sewerage system. This work was done by John J. Cahalan.

RESURFACING OF PARKWAYS AND BOULEVARDS

Blue Hill River Road, Milton and Quincy, from Randolph Avenue to Hillside Street, was regraded, widened and surfaced with bituminous penetration macadam on gravel base. The contractor on this work was the C. & R. Construction Co.

Fellsway East, Malden, from Highland Avenue to Savin Street, was resurfaced on a gravel base with bituminous penetration macadam and the necessary drainage was constructed. This work was done by the M. McDonough Co.

Fellsway West, Medford, from Salem Street to Wicklow Street, inbound roadway, was resurfaced with bituminous penetration macadam, edgestone set, and the necessary drainage constructed. The work was done by G. Rotundi & Son.

Lynn Fells Parkway, Melrose, from near Vinton Street to Melrose Street, was regraded, cement concrete walks and edgestone laid, and the roadway resurfaced with bituminous penetration macadam. The M. McDonough Co. was the contractor.

Mystic Valley Parkway, Winchester, from Highland Avenue to Middlesex Fells Reservation, was resurfaced with bituminous penetration macadam and edgestone was laid. The M. McDonough Co. was the contractor.

Mystic Valley Parkway, Somerville and Medford, from Boston Avenue to Auburn Street, was regraded, walks and edgestone laid, and the roadway resurfaced with bituminous penetration macadam. The M. McDonough Co. was the contractor.

North Beacon Street Bridge, Watertown and Boston was resurfaced with a 2-inch bituminous concrete wearing surface on a concrete base. The work was done by the John P. Condon Corp.

Soldiers Field Road, Boston (Brighton District) from Telford Street 4100

feet northerly was resurfaced with bituminous penetration macadam on a gravel base by the M. McDonough Co.

BRIDGE REPAIRS

General repairs were made to the following drawbridges: Malden River Bridge, Revere Beach Parkway; Wellington Bridge, Middlesex Fells Parkway.

On the Saugus River Bridge, Lynnway, new guard timbers were placed almost the entire length, fences straightened and renewed, and the floor system repaired.

The steel of the draw spans of Dorchester Bay Bridge and Neponset Bridge, Old Colony Parkway, were painted and roadway gates were repaired.

Repairs were made to the Charles River Dam, Boston, and the Cradock Dam, Medford.

MISCELLANEOUS

Extensive repairs were made to the roof of the bathhouse at Revere Beach Reservation by E. Stanley Wires Co., Inc.

Extensive repairs to the subway from the women's section of the bathhouse to the beach were made by contract with Coleman Brothers, Corporation.

Changes were made in the alignment of Revere Beach Parkway near Railroad Street, Revere, and a section of the easterly roadway was resurfaced with bituminous penetration macadam. This work was done by A. G. Tomasello & Son, Inc.

A traffic circle was constructed at the junction of West Roxbury Parkway and Brook Farm Parkway. This circle was built in conjunction with work being done by the City of Boston.

A 4' x 8' reinforced concrete culvert 40 feet long was constructed at Falmouth Street, Saugus, Lynn Fells Parkway, by the forces of the Middlesex Fells Division.

The roof of the laundry and boiler house at Nantasket was repaired by the Finegan Roofing Company.

PLANS, STUDIES AND ESTIMATES

Preliminary plans and estimates have been made for a new Wellington Bridge across the Mystic River in Medford and Somerville and for a new Malden River Bridge on the Revere Beach Parkway, Medford and Everett, to be built under the terms of the National Industrial Recovery Act and chapter 365 of the acts of 1933 of the Commonwealth of Massachusetts.

Plans and estimates have been made for thirty-seven other projects, construction and reconstruction, as part of the Public Works program.

PLANS FOR TAKINGS AND CONVEYANCES

Plans for takings and conveyances have been made as follows:

Plan of conveyance in Saugus on Lynn Fells, Parkway, westerly from Forest Street.

Exchange of lands in Stoneham for Middlesex Fells Reservation on Ravine Road easterly from Fellsway East.

Plan of conveyance in Weston, on River Street northerly from South Avenue, Charles River Reservation.

Taking of land in Boston, northeast corner of Center Street, West Roxbury Parkway.

Taking of land in Brookline for Hammond Pond Parkway, west of Lost Pond.

Plan of easement in Medford, at Foster Court, Mystic Valley Parkway.

Exchange of lands in Newton for Hammond Pond Parkway, southeasterly from Boston and Albany Railroad.

Taking of land in Newton for Hammond Pond Parkway at Beacon Street.

Taking of land in Melrose at northerly corner of Melrose Street, Lynn Fells Parkway.

Plan of lands to be transferred in West Roxbury at Weld Street, West Roxbury Parkway.

Plan of slope rights in Newton, northerly and southerly from Boston and Albany Railroad, Hammond Pond Parkway.

Plan of restriction line in Newton, around Hammonds Pond, Hammond Pond Parkway.

LIGHTING OF PARKWAYS AND BOULEVARDS

The contracts for installing lights on the Revere Beach Parkway overpass at Broadway, Revere, have been made and will be completed in January 1934.

These lights, eleven in number, are a new type of light. The new light will be a Sodium Vapor lamp with tarnish proof aluminum reflectors. The units have an output of 10,000 lumens, and will be the first commercial application.

It is a low cost operating lamp with greater illumination than any existing type.

New parkway lighting installations have been completed and are in operation as follows: Soldiers Field Road, North Beacon Street to Western Avenue, Traffic Circle, West Roxbury Parkway, and Brook Farm Parkway, and also Paul's Bridge, Neponset River Parkway.

PERMITS

One hundred and eighty-eight permits were issued for driveway entrances and miscellaneous purposes and seven orders concerning restrictions were issued and reported upon. This division has furnished the supervision of all driveway construction work and all other work relating to permits and has reported on building operations where violations of restrictions might be involved.

ICE BREAKING IN BASIN

The work of breaking ice in the channels of the Charles River Basin below Longfellow Bridge and in Broad and Lechmere Canals for the season of 1932 and 1933 was done by Charles M. Fauci for the sum of \$4,200.

FINANCIAL

The cost of engineering salaries and expenses was as follows:

Construction:

Salaries	\$64,424.90
Expenses	1,646.81
	—————
	\$66,071.71

Maintenance:

Salaries	\$54,831.60
Expenses	3,923.37
	—————
	58,754.97

Total \$124,826.68

Tables 1 to 9, inclusive, of statistics relative to the parks division are appended.

Respectfully submitted,

BENJAMIN R. DAVIS,
Director of Park Engineering.

TABLE 1.—The following is a record of the traffic through locks and drawbridges during the year:

Charles River Dam Lock and Drawbridge

Number of openings of highway drawbridge	1,490
Number of openings of lock	3,264
Number of vessels	2,056
Number of boats	3,951
Lumber (feet B.M.)	98,000
Coal (tons)	127,713
Coke (tons)	5,477
Oil (gals.)	1,332,000
Oil (bbls.)	709,100
Sand (tons)	88,360
Gravel (tons)	32,755
Granite (tons)	1,790
Dirt (tons)	5,000
Pipe (pieces)	25
Piles	535
Water (gals.)	25,500
Miscellaneous (tons)	95

Neponset River Drawbridge

Number of openings	279
Number of vessels	429
Coal (tons)	30,726
Lumber (feet)	1,107,000

Dorchester Bay Drawbridge

Number of openings	258
Number of vessels	293

Wellington Drawbridge

Number of openings	93
Number of vessels	139

Malden River Drawbridge

Number of openings	104
Number of vessels	124

Cradock Bridge Lock

Number of boats	219
Number of openings	207
Number of canoes, dories etc. over rolls	293

Saugus River Drawbridge

Number of openings	353
Number of vessels	525

TABLE 2.—Metropolitan Park System—Areas of Reservations and Parkways—December 1, 1933.

	Cities.	Beaver Brook.	Blue Hills.	Bunker Hill.	Charles River.	Hart's Hill.	Hemlock Gorge.	King's Beach and Lynn Shore.	Middlesex Fells.	Mystic River.	Nantasket Beach.	Neponset River.	Quincy Shore.	Total Acres.	Alewife Brook.	Blue Hills.	Brook Farm.	Dedham.	Fresh Pond.	Furnace Brook.	Hammond Pond.	Lynn Fells.	Lynway.	Middlesex Fells.	Mystic Valley.	Nahant Beach.	Neponset River.	Old Colony.	Quannapowitt.	Revere Beach.	West Roxbury.	Winthrop.	Woburn.	Total Acres.	Grand Total Reservations and Parkways (Acres).			
1	Boston .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	227.01	1,054.41	1			
2	Cambridge .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	98.61	322.35	2				
3	Chelsea .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	21.16	21.16	3				
4	Everett .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	31.14	31.14	4				
5	Lynn .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	.32	19.91	5				
6	Malden .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	23.58	83.11	6				
7	Medford .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	331.93	1,337.98	7				
8	Melrose .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	14.38	194.57	8				
9	Newton .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	117.46	309.34	9				
10	Quincy .	—	—	2,562.49	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	103.84	2,707.08	10				
11	Revere .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	80.98	145.27	11				
12	Somerville .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	26.78	32.70	12				
13	Waltham .	42.77	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	81.42	13				
14	Woburn .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	22.63	22.63	14				
15	Towns.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	45.50	53.33	15				
16	Arlington .	15.55	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	20.43	35.98	16				
17	Belmont .	67.84	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	67.84	17					
18	Braintree .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	91.66	91.66	18				
19	Brookline .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	785.27	1,955.24	24				
20	Canton .	521.01	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	66.22	66.22	25				
21	Dedham .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	15.16	256.21	20				
22	Dover .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	21	—	21			
23	Hingham .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	25.59	25			
24	Hull .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	13.66	134.75	27		
25	Milton .	1,551.40	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	14.24	257.01	26	
26	Nahant .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	257.01	
27	Needham (Randolph) .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
28	Saugus .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	25.14	
29	Stoneham .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	15.14	
30	Swampscott .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	15.14	
31	Wakefield .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	15.54	
32	Watertown .	80.95	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	15.54	
33	Wellesley .	66.07	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	15.54	
34	Weston .	152.52	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	15.54	
35	Westwood .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6.57	
36	Weymouth .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	35	
37	Winchester .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	48.88	
	Winthrop .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	16.96	
		58.32	4,959.75	6.05	907.81	22.97	23.06	22.69	2,170.79	56.07	25.59	920.36	40.75	64.29	403.72	16.83	9,819.05	144.74	83.58	52.58	37.14	12.40	101.12	192.50	39.67	5.15	80.42	349.45	66.54	80.24	53.47	15.54	127.62	89.25	8.74	23.23	1,563.33	11,382.43

*Includes East Milton St. from Wolcott Square to Paul's Bridge.

TABLE 3.—Metropolitan Park System—Mileage of Roadways—December 1, 1933.

*Equivalent in miles of single roadway - 24.14 miles.

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TABLE 4.—*Lengths of Roads and Bridle Paths in Reservations not open to Motor Vehicles*

	Miles
Blue Hills Reservation	42.08
Middlesex Fells Reservation	17.80
Stony Brook Reservation	1.60
Beaver Brook Reservation . . . . .	.22
Charles River Reservation . . . . .	.89
Hammond Pond Parkway	2.00
	<hr/>
	64.59

TABLE 5—*Electric Street Lights on Parkways and Reservations*

	Lights
Alewife Brook Parkway (26–600 c.p., 1–1500 c.p.)	27
Blue Hills Parkway (600 c.p.)	59
Blue Hills Reservation, Hillside Street (80 c.p.)	14 ¹
Charles River Dam, Reservation (1500 c.p.)	9
Charles River Dam, Roadway (1000 c.p.)	20
Charles River Reservation, Embankment Road (2–60 c.p., 17–600 c.p.)	19
✓ Charles River Reservation, Embankment (250 c.p.)	77
✓ Charles River Reservation, North Beacon Street Bridge (4–1500 c.p., 9–1000 c.p.)	13
Charles River Reservation, Soldiers Field Road (63–1000 c.p., 54–1500 c.p.)	117
✓ Dorchester Bay Bridge (1500 c.p.)	8
Fresh Pond Parkway (100 c.p.)	15
✓ Furnace Brook Parkway (600 c.p.)	58 ²
✓ Harvard Bridge (600 c.p.)	24
Larz Anderson Bridge (100 c.p.)	24
Lynn Fells Parkway (600 c.p.)	28 ³
Lynn Shore Reservation (4–1000 c.p., 44–600 c.p.)	48 ⁴
Lynnway (1–1000 c.p., 10–600 c.p.)	11
Memorial Drive (32–600 c.p., 181–250 c.p.)	213
Middlesex Fells Parkway (7–1500 c.p., 265–600 c.p.)	272 ⁵
Middlesex Fells Reservation (2–80 c.p., 35–250 c.p., 21–600 c.p.)	58 ⁶
Mystic Valley Parkway (1–250 c.p., 89–600 c.p.)	90 ⁷
Nahant Beach Parkway (600 c.p.)	16 ⁸
Nantasket Beach Reservation (41–100 c.p., 13–600 c.p., 21–1000 c.p.)	41 ⁹
✓ Neponset Bridge (600 c.p.)	16
Neponset River Parkway (600 c.p.)	21
Old Colony Parkway (49–1500 c.p., 2–1000 c.p.)	51
Quincy Shore Boulevard (600 c.p.)	57 ¹⁰
Revere Beach Parkway (600 c.p.)	181 ¹¹
Revere Beach Reservation (2–60 c.p., 1–40 c.p., 1–250 c.p., 107–1500 c.p.)	111 ¹²
✓ River Street Bridge (250 c.p.)	8
Saugus River Bridge (100 c.p.)	7

¹All night, April 1 to November 30.

²Nineteen all night, except November 1 to March 31, until 1 A.M. Fourteen all night, April 1 to October 31.

³Seventeen all year until 1 A.M.

⁴Three 600 c.p., June 1 to December 1.

⁵Fifty 600 c.p., March 15 to November 31. Four 600 c.p. all year until 1 A.M.

⁶Two 80 c.p., thirty-five 250 c.p. and three 600 c.p. all year until 1 A.M.

⁷Ten 600 c.p. all night, except November 1 to March 31, until 1 A.M. Thirty-two 600 c.p. all year until 1 A.M.

⁸Four, June 1 to December 1.

⁹Thirteen 600 c.p. in summer only.

¹⁰Forty all night, except November 1 to March 31 to 1 A.M. Eleven all night, April 1 to October 31. Six all year until 1 A.M.

¹¹Seventy-four all night, April 1 to October 31.

¹²Thirty-three 1500 c.p. all night, May 1 to October 31. Thirty-two 1500 c.p. to midnight June 1 to September 30. One 60 c.p. all night, May 1 to September 30.

Lights

24

8

29 ¹³

21

23

4 ¹⁴

1,819

TABLE 6
Miles of Seashore

	Miles
Lynn Shore	1.50
Nahant Beach	2.93
Revere Beach	2.74
Winthrop Shore	1.71
Nantasket Beach	1.02
Quincy Shore	2.19
Total	12.09

Lengths of Sea Walls

	Miles
Lynn Shore	1.30
Revere Beach at Northern Circle . . . . .	.08
Revere Beach at Eliot Circle . . . . .	.15
Revere Beach, shore protection, bath house shelter to Revere Street shelter . . . . .	.29
Winthrop Shore, bridge to Great Head	1.04
Winthrop Shore, bridge to Grover's Cliff . . . . .	.23
Revere Beach, shore protection, south of Northern Circle . . . . .	.28
Quincy Shore Reservation, shore protection south of Webster Street	1.08
Quincy Shore Reservation, southerly end . . . . .	.15
Nantasket Beach Reservation . . . . .	.54
Winthrop Parkway, Revere and Winthrop, Broad Sound Avenue to Sewall Avenue . . . . .	.52
Nahant Beach Parkway, north of Wilson Road . . . . .	.35
Total	6.01

Miles of River Bank

	Miles
Charles River	33.97
Mystic River	8.41
Neponset River	15.86
Alewife Brook	4.50
Total	62.74

TABLE 7
Bridges

Stone masonry bridge	1
Reinforced concrete bridges	23
Steel bridges	16
Wooden bridges	7 ¹¹
Drawbridges	6
Footbridges	12
Total	65

¹ Twenty-seven 600 c.p., all night, except November 1 to March 31, until 1 A.M.¹⁴ Until 1 A.M.¹¹ One half of Wellington Bridge rebuilt with concrete girders.

Culverts

Reinforced concrete and other masonry culverts

54

TABLE 8

Dams

Beaver Brook Reservation, small wooden dams	2
Blue Hills Reservation, small wooden dam	1
Charles River Reservation, wooden dam at Watertown, 220 feet in length	1
Charles River Reservation, Charles River Basin, tidal dam, 1,200 feet in length	1
Charles River Reservation, small stone dam in branch below Washington Street, Newton Lower Falls	1
Charles River Reservation, reinforced concrete dam at Washington Street, Newton Lower Falls, 140 feet in length	1
Furnace Brook Parkway, reinforced concrete dam up-stream from Black's Creek Bridge	1
Hemlock Gorge Reservation, small stone masonry dam with stop planks, in gorge	1
Hemlock Gorge Reservation, small reinforced concrete dam on east branch of river, Newton Upper Falls	1
Hemlock Gorge Reservation, reinforced concrete dam in Charles River at Boylston Street, Newton Upper Falls, 90 feet in length	1
Mystic River Reservation, reinforced concrete tidal dam at Cradock Bridge, 100 feet in length; weirs 400 feet in length	1
Total	12

Lock Gates, Sluice Gates and Tide Gates

Charles River Reservation, Charles River Basin Tidal Dam, 6 lock gates, 13 sluice gates, 43 tide gates.
Mystic River Reservation, Cradock Bridge Tidal Dam, 2 lock gates, 4 sluice gates, 8 tide gates.
Quincy Shore Reservation, 8 tide gates.
Old Colony Parkway, Tenean Street, 1 tide gate.

TABLE 9 — *Police Signal System*

Blue Hills Division	31 1/2
Middlesex Fells Division	27
Charles River Reservation	10
Fresh Pond Parkway	1/2
Total	69

Revere Beach Division police signal system, serving 11 miles of parkways and reservations, and Middlesex Fells Division, serving 1 1/2 miles of parkway, on wires leased from the New England Telephone and Telegraph Company.

REPORT OF DIRECTOR AND CHIEF ENGINEER OF WATER DIVISION

DAVIS B. KENISTON, *Commissioner, Metropolitan District Commission*

SIR: I respectfully submit the following report of the construction and maintenance operations of the Water Division for the calendar year 1933.

Organization

At the beginning of the year there were 57 permanent employees in the main and branch offices, and 303 permanent employees engaged in maintaining and operating the reservoirs, aqueducts, pipe lines, hydroelectric

and pumping stations and in doing miscellaneous construction work. Including the temporary force employed during the summer the maximum number of employees of all classes at any time during the year was 414. There are now 55 permanent employees in the main and branch offices and 316 permanent employees engaged in the maintenance and operation of the works.

Metropolitan Water District and Works

The Water District now includes 20 municipalities with an area of about 174 square miles and a population as of July 1, 1933 of 1,561,290. The Water Works lands include an area of about 19,000 acres, of which about 2,000 acres have been planted with pine trees.

The works under the control of the Water Division include 9 storage reservoirs with 200 square miles of tributary watershed, a total storage capacity of 80 billion gallons and water surface of 8,600 acres; 60 miles of aqueducts; 2 hydroelectric power stations of a capacity of 7,000 horse power; 16 miles of high-tension power transmission line; 5 distribution pumping stations with a combined equipment of 7,800 horse power and pumping capacity of 340 million gallons a day; 12 distribution reservoirs with a capacity of 2.5 billion gallons, and 168.83 miles of distribution mains. The consumption of water from the Metropolitan Water Works during the year by the 18 municipalities regularly supplied was 45,652,017,000 gallons, equivalent to an average daily consumption of 125,074,000 gallons or 87.0 gallons per capita for a population of 1,438,440 in the district supplied.

Construction

WESTON AQUEDUCT SUPPLY MAINS

Contract No. 92, dated July 22, was made with Cenedella & Company of Milford, for furnishing and laying an electric-welded steel water main, 60 inches in diameter and 5,000 feet in length, for the Weston Aqueduct Supply. The new main extends from a connection with the existing 48-inch main in Boston Avenue in Somerville, near the Medford boundary line, in a northerly direction through private land and under the Southern Division of the Boston and Maine Railroad; and thence in a northeasterly direction in the Mystic River Reservation, crossing under the river, and in private land and High Street to Governor's Avenue in Medford, to a connection with the existing 48-inch main at this place. Pipe laying was begun August 7, all of the steel pipes were delivered on the line of the work by December 1, at the close of the year 3,840 feet of pipe line had been laid and the value of the work done amounted to \$90,992.42. Easements were acquired by taking in 18,604 square feet of private land for the pipe line July 20, but no settlements therefor had been made at the close of the year.

NORTHERN HIGH SERVICE PIPE LINES

Contract No. 90, dated February 14, was made with Warren Foundry & Pipe Corporation of Delaware, for furnishing the cast-iron water pipes and special castings required for the new Northern High Service pipe lines, 20 inches in diameter and 21,500 feet in length, extending from Ocean Avenue near Revere Street in Revere to Broad Street at Washington Street in Lynn. This contract was completed August 8 and amounted to \$87,789.78. The new pipe line reinforces the single pipe line through which the towns of Nahant and Swampscott have been supplied with water for a number of years.

Contract No. 91, dated March 28, was made with A. Grande of Boston, for laying the portion of the new line, 10,750 feet in length, between Ocean Avenue and the Saugus River in Revere, located in Ocean Avenue, Revere Street, the Revere Beach Reservation, Lynnway and the State Highway. The work was begun March 29, and was finished July 19. The contract amounted to \$15,212.20.

Contract No. 94, dated July 18, was made with Walsh Holyoke Steam Boiler Works, Inc., of Holyoke, for furnishing electric-welded steel water pipes 20 inches and 30 inches in diameter with rolled steel flanges for use in

the proposed tunnel under the channel of the Saugus River and on the proposed bridge over the river on both sides of the channel. The value of the work done under Contract No. 94 to the close of the year is \$4,534.77.

Contract No. 95, dated September 8, was made with C. Reppucci & Company of Boston, for laying a section of the 20-inch pipe line, 7,950 feet in length, located in Broad Street in Lynn from a point about 1,360 feet north of the Saugus River Bridge to Washington Street. The work was begun September 25 and on account of unfavorable weather was suspended for the winter December 21, after 5,678 feet of the new pipe line had been laid, and 1,488 feet of an old 10-inch calomine pipe line had been relaid with new 16-inch cast-iron pipe in Broad and Nahant streets, between Newhall and Ocean streets. The value of the work done under this contract to the end of the year is \$15,739.24.

PURCHASE OF WATER VALVES FOR PIPE LINES

Contract No. 93, dated July 10, was made with the Chapman Valve Manufacturing Company of Indian Orchard, for furnishing 48 screw lift water valves varying in size from 12 inches to 36 inches in diameter for use on pipe line extensions. Work under this contract was completed at the close of the year. The value of the work done is \$41,741.45.

ADDITIONAL PUMPING EQUIPMENT FOR CHESTNUT HILL STATION No. 1

At the beginning of the year the work of installing the steam pipes, suction and discharge water pipes, valves, Venturi meters and other appurtenances for the additional pumping equipment furnished in 1932 under Contract No. 84, by the Warren Steam Pump Company of Warren, was in progress and as it was necessary to keep the stations in regular service, all of this work was being done with the department forces so that it could be carried on without interfering with the operation of the station. On account of the unfavorable conditions under which the work was done the arrangements for the official duty trials of the new pumping units were not completed until the middle of the year. The small unit, known as No. 20, was tested July 13 and the large unit, No. 19, was tested July 20. The results of the duty trials are as follows:—

Official Duty Trials of Pumping Units Nos. 19 and 20

	No. 19	No. 20
Date	July 20, 1933	July 13, 1933
Duration, 6 hours	10 A.M.-4 P.M.	1 P.M.-7 P.M.
Temperature of air, degrees F.	82	82
Temperature of cooling water, degrees F.	74	72
Temperature of steam at throttle, degrees F.	385	388
Temperature of steam entering condenser, degrees F.	94	85
Barometer, inches of mercury	30	30.1
Vacuum in condenser, inches of mercury	28.4	28.8
Steam pressure, pounds per square inch gage	181.2	181.9
Steam pressure, pounds per square inch absolute	195.9	196.7
Total condensate and sealing water, pounds	94,662	45,471
Steam charged to unit, pounds	91,851	45,165
Pumping rate, gallons per day	50,600,000	15,220,000
Water pumped, gallons	12,650,000	3,805,000
Water pumped, pounds	105,311,250	31,685,250
Elevation of water corresponding to pressure at pump discharge nozzle, feet	261.2	330.1
Correction for gage and velocity head, feet	3.8	2.7
Elevation of water at condenser inlet, feet	128.8	131.3
Head pumped against, feet	136.2	201.5

Duty based on observed cooling water temperature, million foot-pounds per 1,000 pounds steam	156.16	141.36
Contract duty based on 60° cooling water	159.8	144.24
Guaranteed duty	157.2	143.9

The final payment under Contract No. 84 for furnishing and installing the new pumping units was made in December. The total amount paid under the contract is \$67,834.99.

A new horizontal duplex outside end packed boiler feed water pump with a capacity of 30,000 pounds of water per hour, was purchased for the sum of \$1,252 from the Warren Steam Pump Company, Inc., under Contract No. 96, dated November 4, and a new multiple-pass closed type feed water heater with a capacity of 30,000 pounds of water per hour, was purchased for the sum of \$820.80 from the Cochrane Steam Specialty Company of Massachusetts, under Contract No. 97, dated November 10.

Maintenance

PRECIPITATION AND YIELD OF WATERSHEDS

For the Wachusett watershed the annual precipitation of 50.97 inches is 5.83 inches above the average for the past 37 years during which the water works records have been kept for the watershed. This high rainfall for the year is the result of unusually large precipitation in September amounting to 10.88 inches which is the maximum for that month on the Wachusett watershed during the past 37 years. For the Sudbury watershed the annual precipitation of 47.24 inches is 2.83 inches above the average for the past 59 years and for the Cochituate watershed the annual precipitation of 48.20 inches is 3.30 inches above the average for the past 71 years. The precipitation for the month of September on these watersheds was also unusually large, amounting to 10.25 inches on the Sudbury watershed and to 10.84 inches on the Cochituate watershed. The precipitation for the months of June and November was much below normal on all of the watersheds.

The average daily yield per square mile for the watersheds was 1,350,000 gallons for the Wachusett, 999,000 gallons for the Sudbury and 1,183,000 gallons for the Cochituate watershed. These yields are above normal by about 25 per cent on the Wachusett, 3 per cent on the Sudbury and 27 per cent on the Cochituate watershed.

STORAGE RESERVOIRS

The capacities of the storage reservoirs of the Metropolitan Water Works, the elevation of the water surfaces and the quantity of water stored in each reservoir at the beginning and at the end of the year are shown by the following table:

STORAGE RESERVOIRS	Eleva- tion ¹ of High Water to top of flash boards	Total Capacity (Gallons)	JAN. 1, 1933		JAN. 1, 1934	
			Eleva- tion ¹ of Water Sur- face	Available Storage (Gallons)	Eleva- tion ¹ of Water Sur- face	Available Storage (Gallons)
Cochituate Watershed:						
Lake Cochituate ²	144.36	2,097,100,000	143.45	1,784,800,000	142.81	1,635,120,000
Sudbury Watershed:						
Sudbury Reservoir	260.00	7,253,500,000	256.92	4,727,200,000	257.92	5,134,990,000
Framingham Reservoir No. 1	169.32	289,900,000	168.11	143,800,000	167.82	131,260,000
Framingham Reservoir No. 2	177.12	529,900,000	176.17	439,000,000	176.10	436,000,000
Framingham Reservoir No. 3	186.74	1,180,000,000	184.80	863,100,000	184.70	855,100,000
Ashland Reservoir	225.21	1,416,400,000	224.92	984,400,000	224.44	958,000,000
Hopkinton Reservoir	305.00	1,520,900,000	304.52	1,039,800,000	304.13	1,015,460,000
Whitehall Reservoir	337.91	1,256,900,000	337.09	790,600,000	337.10	792,500,000
Wachusett Watershed:						
Wachusett Reservoir	396.50	67,000,000,000	393.39	51,812,600,000	388.66	45,645,760,000
Totals	-	82,544,600,000	-	62,585,300,000	-	56,604,190,000

¹Elevation in feet above Boston City Base.

²Excluding Dudley Pond which was abandoned April 3, 1916.

The total storage capacity shown in the third column of the table is to the bottom of the reservoirs. The available storage shown in columns 5 and 7 is the quantity that can be conveniently used for consumption.

Wachusett Reservoir

At the beginning of the year there was 62,812,600,000 gallons of water stored in Wachusett Reservoir and the water was 1.61 feet below the nominal high-water line which is at elevation 395. The reservoir began to fill early in February, the water reached elevation 395 March 11 and thereafter overflowed at the spillway until May 8 when the water had reached elevation 396.55 and there was 67,070,400,000 gallons stored in the reservoir. The total waste at the spillway was 15,150,700,000 gallons and the maximum overflow from the reservoir was at the rate of 1,050,000,000 gallons per day for a short time early in the afternoon of April 18. From May 8 to September 15 the water in the reservoir was drawn down 8.74 feet to elevation 387.81, the lowest stage during the year. Following heavy rainfall the water rose in the reservoir to elevation 391 on September 25 and during the remainder of the year was drawn down to elevation 388.66 so that at the close of the year the water was 6.34 feet below high-water line and the quantity stored in the reservoir was 56,645,800,000 gallons.

During the past year the city of Worcester did not divert all of the yield of the 9.35 square miles of watershed formerly tributary to the Wachusett Reservoir, and in January, February, March, April and May allowed 2,604,500,000 gallons of water to flow into the watershed now tributary to the Wachusett Reservoir, but payment to the City for this water which was not diverted has not been required under the agreement of November 2, 1914, since early in 1931 when an additional source of water supply of more than 25 square miles was obtained for the Metropolitan Water District. No water was pumped from the Wachusett Reservoir or Quinapoxet Pond by the City during the year.

No water was diverted from the Ware River at Coldbrook to the Wachusett Reservoir during the year and no water was pumped from the reservoir by the town of Clinton under the provisions of Acts of 1923 chapter 348. To comply with the provisions of General Laws, chapter 92, section 14, 590,700,000 gallons of water was discharged from the reservoir into the Nashua River below the dam.

Sudbury Reservoir

At the beginning of the year the water in the Sudbury Reservoir was at elevation 256.92 about 2 feet below the crest of the spillway, which is at elevation 259. Water overflowed at the spillway into Framingham Reservoir No. 3 April 6 to 8, inclusive and April 13 to 22, inclusive. The total overflow amounted to 329,990,000 gallons. The flash-boards were in place up to elevation 260 on the spillway from April 26 to November 14, and during this period the elevation of the water in the reservoir varied from a low of 258.13 on July 3 to a high of 259.93 on August 12. From November 14 to the end of the year the water was kept about one foot below the crest of the spillway, and went down to elevation 257.27 on December 4 and up to elevation 258.34 on December 30.

The Sudbury Power Station was out of service June 10 to 13, inclusive, on account of damage caused by an electrical storm and from November 27 to 29, inclusive, while making transmission line repairs. During these periods 462,700,000 gallons of water was by-passed from the reservoir into the Weston Aqueduct for consumption. With the exception of this bypassed water and the overflow at the spillway, totaling 792,690,000 gallons, all of the water drawn from the reservoir was used to generate electric energy.

The work of caring for the reservoir lands and structures has been performed in the usual manner.

Framingham Reservoir No. 3

The flash-boards were kept on the spillway of the dam at Framingham Reservoir No. 3 during the entire year so that the water could be held in the reservoir at a convenient elevation for use in maintaining the flow in the Sudbury Aqueduct for supplying the town of Framingham and the Chestnut Hill Distributing Reservoirs in Boston; and also so that water could be wasted from the reservoir and be replaced with water of better quality from the Sudbury and Wachusett reservoirs. From January 1 to May 6, inclusive, 9,293,500,000 gallons of water was wasted from Reservoir No. 3 into Reservoir No. 1 to improve the quality of the supply. On account of a very unusual yield from a very heavy rainfall, it was necessary to waste 422,000,000 gallons of water from the reservoir from September 16 to 19, inclusive, to prevent the water from rising in the reservoir above extreme high-water line.

All of the Water Works property at the reservoir has received the attention necessary to keep it in good condition.

Ashland, Hopkinton and Whitehall Reservoirs and the South Sudbury Pipe Lines and Pumping Station

No water was drawn from the Ashland, Hopkinton and Whitehall reservoirs for consumption in Framingham or in the Metropolitan Water District during the year, but these reservoirs have been kept well filled with water and the yield not required for this purpose has been allowed to run to waste down the Sudbury River. A small flow of water was maintained in the pipe line from Whitehall Reservoir to Hopkinton Reservoir from January 1 to May 5 and from November 20 to the end of the year to prevent the water from freezing in the pipe line. The usual maintenance work has been performed at all of these reservoirs during the year.

The Metropolitan District Water Supply Commission by vote of April 18 turned over to the Metropolitan District Commission all of the works constructed for the extension and diversion of the South Sudbury supply under authority of Acts of 1927, Chapter 111, and all of the property incidental thereto, to be maintained and operated as a part of the Metropolitan Water System under General Laws, Chapter 92. These works include a pipe line, 24 inches in diameter for a distance of 13,426 feet and 20 inches in diameter for a distance of 937 feet for diverting water from Ashland Reservoir to the gate house at the dam of Framingham Reservoir No. 2; a pipe line 20 inches in diameter and 6,750 feet in length for diverting water from Whitehall Reservoir to Hopkinton Reservoir; a pumping station at Cordaville, and a supply main 30 inches in diameter and 6,977 feet in length from Hopkinton Reservoir to a junction with a supply main 30 inches in diameter and 1,330 feet in length from the Cordaville Mill Pond on the Sudbury River to the pumping station; and a force main 30 inches in diameter and 7,447 feet in length through which water can be diverted from these supply mains to the Sudbury Reservoir. The property incidental to these works includes 259.56 acres of land, and easements in 29.02 acres of additional land. These works were kept ready for service but were not used during the year because of the abundant supply of better water obtained from the Wachusett and North Sudbury supplies.

Framingham Reservoirs Nos. 1 and 2 and Farm Pond

No water has been drawn directly from Framingham Reservoirs Nos. 1 and 2 and Farm Pond for water supply purposes for some years, but they have been kept well filled with water and the excess yield from their watersheds has been allowed to run to waste down the Sudbury River.

The usual flow of 1,500,000 gallons per day has been maintained from Reservoir No. 1 into the Sudbury River below Dam No. 1 as required by Acts of 1872, Chapter 177.

The town of Framingham pumped 184,955,000 gallons of water from its filter galleries on the shore of Farm Pond during the year; this water was

pumped between January 1 and October 10, inclusive, and between November 28 and the end of the year.

Under legislative authority the Boston & Albany Railroad used approximately 28,888,000 gallons of water and the New York, New Haven & Hartford Railroad used approximately 4,210,000 gallons of water directly from Farm Pond for use of locomotives during the year.

Water was wasted from Farm Pond into the Sudbury River from March 9 to 25, inclusive, and from April 1 to 28, inclusive. The total waste was 39,700,000 gallons.

Lake Cochituate

No water was drawn from Lake Cochituate for the supply of the Metropolitan Water District during the year but 7,364,700,000 gallons was wasted at the outlet to maintain the water at the desired elevation in the lake. The water in the lake reached the lowest stage during the year, 1.5 feet below high-water line, on December 31.

AQUEDUCTS

The *Wachusett Aqueduct* was used on 296 days during the year, the total time in service amounting to 131 days, 16 hours and 5 minutes, and the quantity of water discharged from the Wachusett Reservoir into the aqueduct was 46,300,900,000 gallons, equivalent to an average draft of 126,852,000 gallons per day for the entire year, and all of the water was used to generate electric energy at the Wachusett power station before it was discharged into the aqueduct.

During the year the Westborough State Hospital pumped 77,726,000 gallons of water from the aqueduct terminal chamber in Marlborough, equivalent to an average use of 213,000 gallons per day.

A complete new set of hard pine stop planks was made for the upper and lower dams on the open channel.

The *Weston Aqueduct* was used every day during the year, the total time in service being 359 days, 13 hours and 37 minutes, and the total quantity of water conveyed from the Sudbury Reservoir to the Weston Reservoir was 39,716,800,000 gallons, equivalent to an average daily flow of 108,813,151 gallons. With the exception of 462,700,000 gallons of water by-passed for hydroelectric unit No. 1 at the Sudbury power station, all the water delivered through this aqueduct was used for the generation of electric energy.

The *Sudbury Aqueduct* was in continuous use during the year. The supply for this aqueduct, 4,847,600,000 gallons, was drawn entirely from Framingham Reservoir No. 3, of which the town of Framingham pumped 319,010,000 gallons for its supply and the remaining 4,528,200,000 gallons, equivalent to an average of 12,406,027 gallons a day, was delivered to Chestnut Hill Reservoir for consumption in the Metropolitan Water District. Current meter measurements of the flow of water in the aqueduct made at times during the year showed a variation of coefficient of flow from 98.5 per cent at the beginning of the year to 99.3 per cent at the end of the year.

The *Cochituate Aqueduct* was not used during the year but was kept ready for use in case of emergency.

All of the aqueduct lands and structures have been cared for in the usual manner.

PROTECTION OF THE WATER SUPPLY

To prevent pollution of the water supply a Sanitary Engineer and seven watchmen have been employed throughout the year to inspect ice cutting and other operations and the condition of premises on the watersheds and to enforce the sanitary rules and regulations. The service of Charles N. Hargraves, Senior Sanitary Engineering Aid on this work, was terminated by his death July 30.

Water Division forces have operated the filter-beds on Beaman Street in

West Boylston, where the sewage from the Worcester County Training School, which is occupied by about 41 persons, was purified throughout the year. The Gates Terrace filter-beds at Sterling Junction were operated continuously from May 1 to October 29 to purify the sewage from summer cottages in that vicinity. Sewage from the Eagleville Mill and the Mount Pleasant House in Holden, from the Fay School and Deerfoot Farm sausage factory and dairy at Southborough was purified by privately owned and operated filter plants.

Surface water from thickly settled drainage areas of 525 acres in the village of Sterling, from 1,280 acres along the brook near Maple Street in Marlborough, from 700 acres along Pegan Brook and an intercepting ditch in Natick was purified by filters operated by Water Division forces before it flowed into the water supply, with the exception of an overflow of 556,000 gallons from the brook near Maple Street in Marlborough, which was sterilized with chlorine before it entered Sudbury Reservoir and of 40,593,000 gallons from Pegan Brook and 97,561,000 gallons from the intercepting ditch in Natick, which was sterilized with chlorine before it entered Lake Cochituate.

At the Pegan Brook filters the pumping station was operated on 242 days and 209,475,000 gallons of water was pumped to the filters, an average of 573,904 gallons a day for the entire year. The cost of operating the station and caring for the grounds and filter-beds was \$5,826.94 for labor, \$346.93 for fuel and \$228.85 for supplies and repairs, a total of \$6,402.41, which is \$30.56 per million gallons filtered. The fuel cost per million foot gallons was \$0.15.

The cost of protecting the water supply by filtration was \$1,046.00 for the Wachusett, \$4,913.66 for the Sudbury and \$6,402.41 for the Cochituate watershed.

During the year 41,094 pounds of copper sulphate was applied to 16,790 million gallons of water in a number of storage and distributing reservoirs as an algaecide to destroy microscopical organisms, principally Uroglenopsis, Synura, Dinobryon and Anabaena, which occurred in sufficient numbers to give the water an unpleasant taste and odor. Copper sulphate was applied as follows: On August 24, 575 pounds was applied in 225 million gallons of water in the Weston Reservoir; August 23 to 30, 18,350 pounds was applied in 7,980 million gallons of water in the Sudbury Reservoir; between August 30 and September 3, 2,890 pounds was applied to 1,040 million gallons of water in Framingham Reservoir No. 3, and September 1 in the Chestnut Hill Reservoir 1,275 pounds was applied to 490 million gallons of water in the Bradlee basin and 450 pounds was applied to 156 million gallons in the Lawrence basin; October 7 and 8, 4,375 pounds was applied to 1,722 million gallons of water in Spot Pond; November 25 to December 6, 3,294 pounds was applied to 1,307 million gallons of water flowing from the Sudbury Reservoir into the Weston Aqueduct and Framingham Reservoir No. 3; December 1 to 7, 9,885 pounds was applied to 3,870 million gallons of water in the Southborough arm and a small portion of the Marlborough arm of the Sudbury Reservoir. The cost of the copper sulphate used as an algaecide during the year was \$1,782.13.

Beginning about one week after the copper sulphate had been applied to Spot Pond and continuing for about two weeks, all of the water supplied from Spot Pond was sterilized with chlorine.

All water drawn from the storage reservoirs for consumption during the year was sterilized with chlorine as follows: Water drawn from Framingham Reservoir No. 3 to the Sudbury Aqueduct at Dam No. 1 was sterilized by the ammonia-chlorine process to insure proper sterilization of the water 16 miles below at the outlet of the aqueduct at Chestnut Hill Reservoir and all water drawn from Weston Reservoir at the screen chamber was sterilized with liquid chlorine. The total amount of anhydrous ammonia and liquid chlorine used is as follows: At the entrance to the Sudbury Aqueduct 5,403 pounds of anhydrous ammonia and 26,223 pounds of liquid chlorine; at the outlet from the Weston Reservoir 158,351 pounds of liquid chlorine.

Total expenditure for the materials used in sterilizing the water supply during the year was \$9,559.70.

Improved brook channels, ditches, culverts and watering places were maintained in the usual manner. The cost of maintaining 35 miles of drainage ditches on all the watersheds was \$5,798.00.

For the protection of the water supply, on May 26, 76.6 acres of land located in Holden on the Quinapoxet River was acquired from the estate of Etta L. Davis and November 18, 9.87 acres of land in Holden and West Boylston near the Quinapoxet River was acquired from the estate of Warren Alexander.

CLINTON SEWAGE DISPOSAL WORKS

The works constructed under the provisions of Acts of 1898, chapter 557, for disposing of the sewage of the town of Clinton, were operated 352 days during the year. The quantity of sewage pumped and disposed of averaged 1,444,000 gallons per day. The cost of operating the pumping station was \$4,294.87, which is \$8.45 per million gallons, equivalent to \$0.17 per million foot gallons. The cost of operating the filters and intercepting sewer was \$9,485.57, which is \$18.66 per million gallons of sewage disposed of. On 12 days in April and 1 day in May the works were idle because of the large amount of ground water that entered the sewers which combined with the sewage exceeded the capacity of the pump.

FORESTRY

The new plantings made during the year included 110,210 white, red, Austrian and Norway pines in the Wachusett Section; 200 white pine, 4,000 spruce, 52,000 arbor vitae and 200 Mugho pines in Sudbury Section, and 200 pines, 100 fir, and 7,800 arbor vitae in the Distribution Section.

In the Wachusett Section 75,000 board feet of standing white pine timber was sold. Brush, grass and weeds were mowed and burned on 69 miles of fire guards and forest roads 15 to 45 feet wide, at a cost of \$58 per mile.

The total expenditure for forestry was \$30,951.23. of which \$2,617 was expended for protecting the trees and shrubs from insects.

Beginning late in November considerable work was accomplished with Civil Works Administration forces employed on forestry work in the Wachusett, Sudbury and Distribution sections. The total forces working in the Water Division averaged about 135, who were employed on the basis of 30 hours per week and were paid \$10,000 with funds provided for the purpose by the Federal Government.

HYDROELECTRIC SERVICE

The hydroelectric power stations at the Wachusett Dam in Clinton and at the Sudbury Dam in Southborough are operated by the water drawn for water supply from the reservoirs above these dams.

During the year 15,236,400 kilowatt hours of electric energy was developed at the power stations or approximately 13 per cent over the usual output.

The value of the energy delivered in 1933 at contract prices is \$93,350.99 and deducting \$52,184.37, the expenditures charged to the operation of both stations and the Water Division transmission line, there was a profit of \$41,166.62.

Wachusett Station

The power station was operated on 296 working days during the year. The statistics are as follows:—

Total energy developed (kilowatt hours)	9,940,400
Energy used at power station (kilowatt hours)	30,298

Available energy (kilowatt hours)	9,910,102
Water used (gallons)	46,597,200,000

22	P.D. 48
Average head (feet)	\$95.48
Energy developed per million foot gallons (kilowatt hours)	2.234
Efficiency of station (per cent)	71.10
Credits:	
Energy sold New England Power Company and Edison Electric Illuminating Com- pany: 9,708,142 kilowatt hours at \$0.00625 . . .	\$60,675.89
Deduction of 2 per cent as provided in con- tract: 194,163 kilowatt hours at \$0.00625 . . .	1,213.52
Energy furnished Clinton Sewerage Pumping Station: 201,960 kilowatt hours at \$0.00625 . . .	1,262.25
	<hr/>
	\$60,724.62
Charges:	
Superintendence	\$1,472.35
Labor, operating station	8,737.89
Repairs and supplies	1,502.21
Transmission line repairs and supplies . . .	157.84
	<hr/>
	\$11,870.29
Taxes	4,000.00
Administration, general supervision, interest and sinking fund	11,023.51
	<hr/>
	\$26,893.80
Profit	\$33,830.82
Cost of available energy per thousand kilowatt hours . . .	\$2.714

Sudbury Station

The Sudbury power station was operated on 363 days during the year; on 358 days for 24 hours with three shifts, on 4 days for 16 hours with two shifts, and on one day for 4 hours. The statistics are as follows:

Total energy developed (kilowatt hours)	5,296,000
Energy used at power station (kilowatt hours) . . .	75,780
	<hr/>
Available energy (kilowatt hours)	5,220,220
Framingham Reservoir No. 3 service:	
Water used (gallons)	12,780,300,000
Average head (feet)	65.51
Weston Aqueduct service:	
Water used (gallons)	39,254,100,000
Average head (feet)	38.72
Energy developed per million foot gallons (kilowatt hours)	2.247
Efficiency of station (per cent)	71.6
Credits:	
Energy sold Edison Electric Illuminating Company: 5,220,220 kilowatt hours at \$0.00625	\$32,626.37

Charges:	
Superintendence	\$1,813.86
Labor, operating station	14,404.16
Repairs and supplies	812.81
	<hr/>
	\$17,030.83
Taxes	1,984.00

Administration, general supervision, interest and sinking fund	\$6,275.44	
		\$25,290.57
Profit		\$7,335.80
Cost of available energy per thousand kilowatt hours		\$4.845

DISTRIBUTION PUMPING STATIONS

At the five distribution pumping stations 22,300 million gallons of water was pumped during 1933. This is 3,944 million gallons less than was pumped in 1932. The water pumped at the Chestnut Hill stations included 268 million gallons for the low service and 16,478 million gallons for the high service. The high service pumpage includes 5,998,000 gallons for a portion of the supply of the town of Brookline and 120,702,000 gallons for a portion of the supply of the city of Newton, and 543 million gallons which was repumped at the Hyde Park Station for the southern extra high service. At the Spot Pond Station 4,317 million gallons was pumped for the northern high service and at the Arlington Station 694 million gallons was pumped for the northern extra high service. By arrangement with the city of Newton 537,325,000 gallons of water was repumped from the southern high service between November 28, 1932 and November 25, 1933 by the city at its Ward Street booster station for use on the high lands in Belmont and Watertown where satisfactory service cannot be furnished from the Chestnut Hill Station, and for this pumping the Commonwealth has paid the city \$6,746.95.

The average engine duties at the Water Division stations, based on plunger displacement and total fuel used for all purposes, including heating and lighting the stations, are as follows:

At Chestnut Hill Station No. 1 for nine months, January to September, inclusive, 126,892,673 foot pounds per 100 pounds of bituminous coal averaging 14,713 British thermal units per pound. For November and December 152,464,611 foot pounds per 100 pounds of oil averaging 18,436 British thermal units per pound.

Chestnut Hill Station No. 2, 128,927,300 foot pounds per 100 pounds of mixed bituminous and anthracite coal averaging 14,501 British thermal units per pound.

Spot Pond Station 111,079,200 foot pounds per 100 pounds of bituminous coal averaging 14,843 British thermal units per pound.

Arlington Station, 102,738,900 foot pounds per 100 pounds of mixed bituminous and anthracite coal averaging 14,309 British thermal units per pound.

Hyde Park Station, 70,543,600 foot pounds per 100 pounds of mixed bituminous and anthracite coal averaging 14,263 British thermal units per pound.

At the beginning of the year there was 1,269 gross tons of bituminous coal and 261 gross tons of anthracite screenings on hand at the pumping stations, and the amount on hand at the end of the year was 814 gross tons of bituminous coal, 22 gross tons of anthracite screenings and 13,717 gallons of oil. During the year 7,157 gross tons of bituminous coal, 1,443 gross tons of anthracite screenings and 109,875 gallons of oil were burned at the pumping stations.

The work of installing fuel oil burning equipment at the Chestnut Hill pumping stations under Contract No. 56-M, begun in 1932, was continued. The installation of the equipment for three boilers, Nos. 26, 27 and 28, in Chestnut Hill Station No. 1, was completed so that the burning of oil for fuel in these boilers in regular service was begun October 14. The installation of the oil burning equipment in the three other boilers, Nos. 20, 21 and 22, at Station No. 1 was completed November 25. The work of insulating the new boilers, Nos. 29, 30 and 31, at Station No. 2 with non-heat-conducting covering under Contract No. 57-M, begun in 1932, was completed February 7.

The work begun in 1932 under Contract No. 59-M of installing flexible stay bolts in three old boilers, Nos. 20, 21, and 22, in Station No. 1 was com-

pleted March 31 and in one old boiler, No. 16, at Station No. 2 was completed April 21.

Contract No. 65-M for retubing boilers Nos. 15 and 16 at Station No. 2, with No. 12 gage seamless steel boiler tubes in compliance with the American Society of Mechanical Engineers Power Boiler Code, was made with The Hodge Boiler Works, Boston, December 8 and the work was in progress at the close of the year.

Necessary repairs were made at all of the pumping stations and the usual care was taken of all machinery and equipment.

DISTRIBUTION RESERVOIRS

The locations, elevations and capacities of the distribution reservoirs of the Metropolitan Water Works are shown by the following table:

DISTRIBUTION RESERVOIRS AND LOCATIONS	Elevation of High Water ¹	Capacity in Gallons
Low Service:		
Spot Pond, Stoneham and Medford	163.00	1,791,700,000
Chestnut Hill Reservoir, Brighton district of Boston	134.00	300,000,000
Weston Reservoir, Weston	200.00	200,000,000
Mystic Reservoir, Medford	157.00	26,200,000
Northern High Service:		
Fells Reservoir, Stoneham	271.00	41,400,000
Bear Hill Reservoir, Stoneham	300.00	2,450,000
Northern Extra High Service:		
Arlington Reservoir, steel tank, Arlington	442.50	2,000,000
Southern High Service:		
Fisher Hill Reservoir, Brookline	251.00	15,500,000
Waban Hill Reservoir, Newton	264.50	13,500,000
Forbes Hill Reservoir, Quincy	192.00	5,100,000
Forbes Hill Standpipe, Quincy	251.00	330,000
Southern Extra High Service:		
Bellevue Reservoir, steel tank, West Roxbury district of Boston	375.00	2,500,000
Total	-	2,400,680,000

¹Elevation in feet above Boston City Base.

Powder Horn Hill Reservoir of the city of Chelsea is used when necessary for the northern high service. It has a capacity of 1,000,000 gallons with high-water line at elevation 196.6 and was in service from January 1 to April 8.

The Mystic and Forbes Hill reservoirs have been kept full of water for an emergency but were not used during the year.

Both the Lawrence and the Bradlee basins of the Chestnut Hill Reservoir were in service throughout the year.

All other distribution reservoirs were in regular service throughout the year.

The Parks Division was paid \$2,000 for police service at Spot Pond, Fells and Bear Hill reservoirs.

The steel tank at the Bellevue Reservoir was out of service from April 21 to June 8 on account of being painted, and the Forbes Hill standpipe was out of service for painting from May 16 to June 13. The cost of painting the steel tank of the Bellevue Reservoir was \$1,424.13 and the cost of painting the Forbes Hill standpipe was \$720.07.

The tower at the Arlington Reservoir was opened to the public on Saturday afternoons and Sundays by the Parks Division from August 5 to November 5, inclusive.

Contract No. 64-M was made with the West End Iron Works of Cambridge November 14 for furnishing and erecting 5,845 linear feet of picket fence and 3,350 feet of chain-link fence around the northerly half of Spot Pond in Stoneham. At the end of the year 1,488 linear feet of chain-link fence had been erected and 585 concrete foundations for the fence posts of the picket fence had been constructed.

DISTRIBUTION PIPE LINES

The work of relaying 160 feet of 12-inch flexible jointed southern extra-high service pipe line at the Neponset River crossing at West Street in Hyde

Park, under Contract No. 60-M, which was in progress at the close of 1932, was completed January 23.

In connection with the construction of a section of Metropolitan Park Boulevard the No. 4 Weston Aqueduct Supply Main, which was put into service in November, 1932, was lowered by the Metropolitan Parks contractor for a distance of 473 feet at Hillside Avenue in Brighton between February 18 and April 10.

In connection with the rebuilding of the Adams Street Bridge over the Neponset River at Milton Lower Mills, 143 feet of southern high service 24-inch cast-iron pipe line was relaid with 24-inch electric-welded steel pipe with rolled steel flanges and bolted joints.

In connection with the construction of an overpass at Winthrop Avenue and the Revere Beach Parkway near Stower's Court in Revere, 330 feet of 16-inch northern high service pipe line was relaid.

In connection with the rebuilding of the culvert and reconstruction of Bennington Street at the East Boston-Revere boundary line, 80 feet of 12-inch and 80 feet of 16-inch northern high service pipe line was raised about 1½ feet.

A 20-inch connection was made between the 30-inch and 40-inch southern low service mains in Washington Street at Brookline Avenue in Brookline.

Three standpipes were erected as part of the local distribution systems during the year. The town of Swampscott erected a standpipe 40 feet in diameter and 92 feet in height, with a capacity of 867,000 gallons and high-water at elevation 220. The town of Milton erected two standpipes in the Blue Hill Reservation, one off Blue Hill Avenue, 64 feet in diameter and 25 feet high with a capacity of 600,000 gallons, and the other off Randolph Avenue, 30 feet in diameter and 28½ feet high, with a capacity of 150,000 gallons. The tops of both of these standpipes are at elevation 375.

During the year 29 leaks were repaired on the Metropolitan Water Works distribution mains at a cost of \$1,740.71.

There are 90 Venturi meters, varying in size from 6 to 60 inches in diameter, in the distribution pipe lines; 73 of these are on connections supplying various towns in the Metropolitan Water District; 5 are on the Weston Aqueduct supply mains; 1 between the southern high service and the southern low service mains; 5 at the Arlington, Chestnut Hill, Hyde Park and Spot Pond pumping stations; 1 at the city of Newton booster pumping station on Waban Hill; 2 on connections between the Weston Aqueduct supply mains and the local pipes in Washington Street, Newton; 1 on connection to the Fernald School in Waltham, and 2 on emergency connections with Cambridge and Wakefield distribution pipes. There are also 10 disc and 16 detector meters in use for measuring small quantities of water supplied at various places.

There are 7 pressure regulating valves in constant use for reducing pressure of water supplied to Revere, Swampscott and Winthrop, and the higher portion of Chelsea for part of the year.

Recording pressure gauges have been maintained at 34 places on the distribution system and tables in the Appendix show the hydraulic grade at 16 of these stations as determined by the charts.

Pipes, specials and other materials and supplies required for maintaining and operating the pipe lines are kept on hand at the Glenwood pipe yard in Medford and the Chestnut Hill pipe yard in Brighton.

Auto trucks equipped with gate-operating attachments have been maintained with men on duty ready to operate them in case of emergency at any time during the day or night.

CONSUMPTION OF WATER

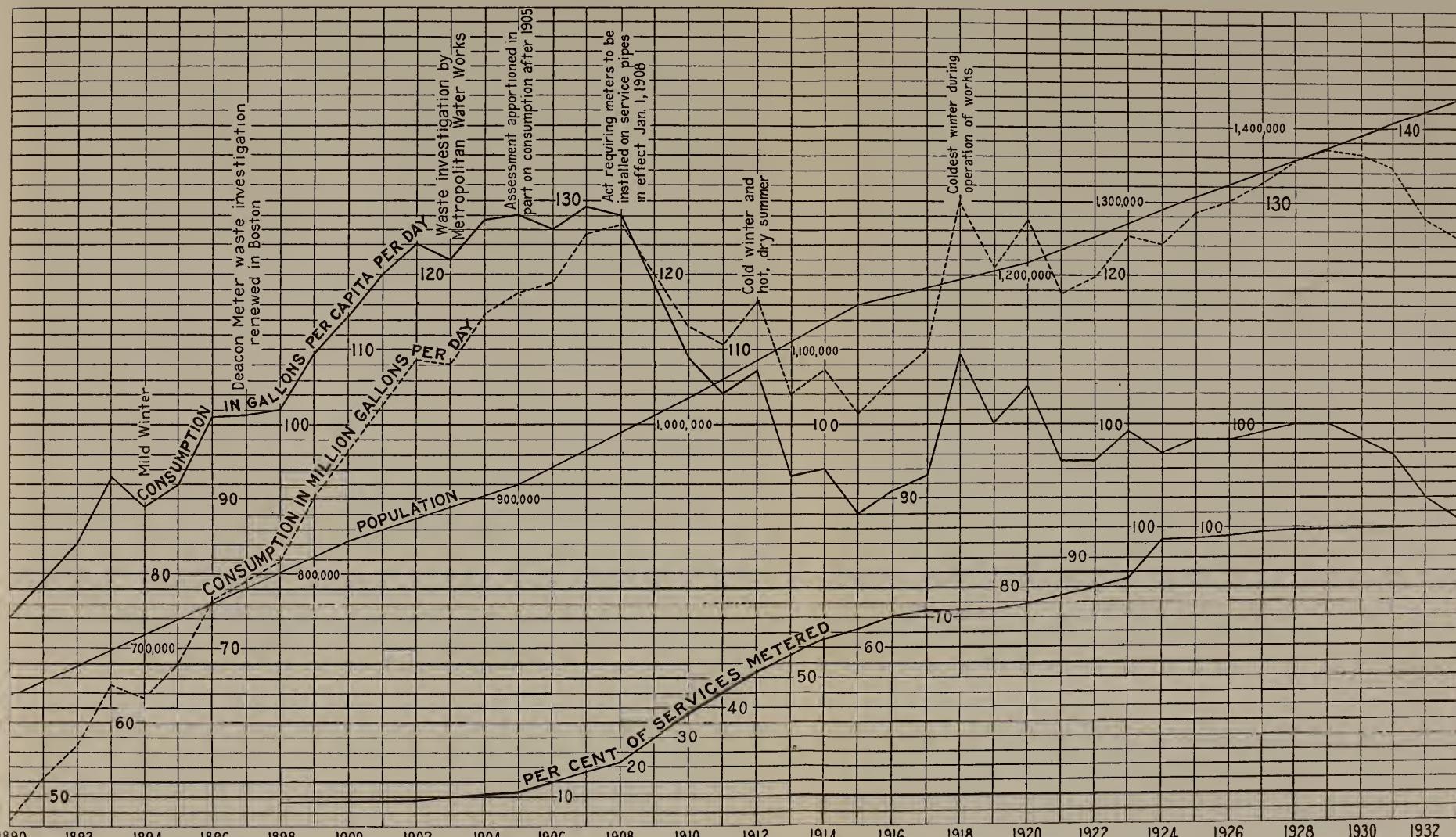
During the year 45,652,017,000 gallons of water was furnished from the Metropolitan Water Works to the 18 cities and towns regularly supplied. This is equivalent to an average daily consumption of 125,074,000 gallons, and for the estimated population of 1,438,440 is at the rate of 87 gallons per capita.

The town of Brookline, with an estimated population of 51,490, used from its local source 1,676,190,000 gallons of water, of which 364,788,000 gallons was supplied from elevation 375 and 1,311,402,000 gallons was supplied from elevation 250. In addition to this consumption from its local source, the town was supplied with 5,998,000 gallons of water from elevation 250 from the Metropolitan supply, making the total consumption of the town 1,682,188,000 gallons, equivalent to an average daily consumption of 4,608,700 gallons or 90 gallons per capita.

The city of Newton, with an estimated population of 71,360, used from its local source 1,598,467,000 gallons and 120,702,000 gallons from the Metropolitan supply, a total consumption of 1,719,169,000 gallons, equivalent to an average daily consumption of 4,710,100 gallons or 66 gallons per capita. The amount of water furnished the city of Newton from the Metropolitan supply is 107,202,000 gallons in excess of the quantity which the city is entitled to take free of charge under an agreement made in 1900 when the Waban Hill Reservoir was purchased from the city, and for this water the city will pay \$12,020.56.

The population, consumption of water and per cent of services metered in the Metropolitan Water District as supplied in 1933 and for the period from 1890 to 1933, inclusive, are shown graphically by the accompanying diagram.

POPULATION, CONSUMPTION OF WATER AND PER CENT OF SERVICES METERED
 IN THE
 METROPOLITAN WATER DISTRICT
 AS SUPPLIED IN 1933
 FROM 1890 TO 1933



Note: Estimated population and consumption per capita given on diagrams published in previous annual reports are revised from time to time as regular census figures become available.

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The average daily consumption of water in each of the municipalities in the Metropolitan Water District during 1932 and 1933 is as follows:

	Estimated Population, 1933	AVERAGE DAILY CONSUMPTION				
		1932		1933		Decrease in Gallons
		Gallons	Gallons per Capita	Gallons	Gallons per Capita	
Arlington . . .	42,260	1,926,800	48	2,120,900	50	194,100 ¹
Belmont . . .	25,330	1,398,300	58	1,438,700	57	40,400 ¹
Boston . . .	783,510	85,176,300	109	82,999,100	106	2,177,200
Chelsea . . .	47,700	3,469,200	74	3,339,700	70	129,500
Everett . . .	51,890	4,365,000	86	4,305,900	83	59,100
Lexington . . .	10,420	674,300	67	629,400	60	44,900
Malden . . .	62,340	3,585,100	59	3,551,900	57	33,200
Medford . . .	66,730	3,370,300	52	3,222,000	48	148,300
Melrose . . .	24,930	1,577,500	65	1,512,200	61	65,300
Milton . . .	18,640	893,200	50	884,200	47	9,000
Nahant . . .	1,680	202,400	120	206,600	123	4,200 ¹
Quincy . . .	78,650	5,227,900	68	5,107,000	65	120,900
Revere . . .	38,320	2,160,000	58	2,054,900	54	105,100
Somerville . . .	107,660	9,093,400	85	8,723,500	81	369,900
Stoneham . . .	10,520	715,800	69	831,900	79	116,100 ¹
Swampscott . . .	11,070	770,200	71	782,000	71	11,800 ¹
Watertown . . .	39,350	2,185,100	57	2,186,500	56	1,400 ¹
Winthrop . . .	17,440	1,202,500	70	1,177,600	68	24,900
District supplied .	1,438,440	127,993,300	90	125,074,000	87	2,919,300
Brookline . . .	51,490	4,663,200	93	4,608,700	90	54,500
Newton . . .	71,360	5,022,300	72	4,710,100	66	312,200
Total District .	1,561,290	137,678,800	89	134,392,800	86	3,286,000

¹Increase.

The consumption by districts in 1933 as compared with 1932 is as follows:

		Gallons per Day 1933	DECREASE FROM 1932	
			Gallons per Day	Percent- age
Low service district, embracing the low-service districts of Arlington, Belmont, Boston, Chelsea, Everett, Malden, Medford, Somerville and Watertown . . .		63,833,700	1,991,400	3.03
Southern high-service district, embracing Quincy, the high-service district of Boston, except East Boston, and portions of Milton and Watertown . . .		44,130,300	677,600	1.51
Southern intermediate high-service district, embracing portions of Belmont and Watertown . . .		1,470,100	24,800	1.66
Northern high-service district, embracing Melrose, Nahant, Revere, Stoneham, Swampscott, and Winthrop and the high-service districts of Chelsea, East Boston, Everett, Malden, Medford and Somerville . . .		12,290,700	184,500	1.48
Southern extra high-service district, embracing the higher portions of Hyde Park, Milton and West Roxbury . . .		1,513,900	194,900	11.41
Northern extra high-service district, embracing Lexington and the higher portions of Arlington and Belmont . . .		1,835,300	153,900 ¹	9.15 ¹
District Supplied		125,074,000	2,919,300	2.28
Brookline and Newton		9,318,800	366,700	3.79
Total District		134,392,800	3,286,000	2.39

¹Increase.

**WATER FROM METROPOLITAN WATER WORKS SOURCES USED OUTSIDE OF
THE METROPOLITAN WATER DISTRICT**

PLACES WHERE WATER IS USED	Total Quantity (Gallons)	Average Quantity (Gallons per Day)	Amount Charged
Town of Rutland	76,260,400 ¹	208,900	—
Town of Holden	24,432,400 ²	66,900	—
Westborough State Hospital	77,726,000	213,000	\$2,331.78
Town of Westborough	78,000,000	214,000	—
Town of Southborough	25,324,900	69,000	—
Town of Ashland	71,229,800	195,000	—
Town of Hopkinton	23,760,800	65,000	—
Town of Framingham	503,965,000	1,380,700	13,115.52
Town of Natick	283,190,000	776,000	—
United States Army Reservation at Peddock's Island in Hull	540,000 ³	1,480	46.53
Portion of Town of Braintree	195,000 ⁴	530	—
Portion of Town of Winchester	1,119,000 ⁵	3,070	—
Portion of Town of Saugus	631,000 ⁶	1,730	—
Metropolitan Parks, Middlesex Fells	6,401,000	17,540	—
Walter E. Fernald State School and Metropolitan State Hospital	145,259,000	397,970	14,241.19 ⁷

Notes: — Water is used throughout the year in all places.

The average daily use is in all cases figured on basis of 365 days.

¹All but 403,900 gallons diverted from watershed.

²Not diverted from watershed.

³Water supplied by the Commission through City of Quincy pipes, and by agreement revenue is divided in equal shares between the City and Commonwealth.

⁴The City of Quincy supplies the water and pays the Commonwealth by an addition to its regular apportionment.

⁵The Town of Arlington supplies the water and pays the Commonwealth by an addition to its regular apportionment.

⁶The City of Melrose supplies the water and pays the Commonwealth by an addition to its regular apportionment.

⁷For fiscal year ending November 30.

Information regarding the installation of meters on service pipes by the municipalities supplied with water from the Metropolitan Water Works for the year 1933 and other statistics are given in tables in the Appendix.

Respectfully submitted,

WILLIAM E. FOSS,

Director and Chief Engineer.

BOSTON, JANUARY 2, 1934.

REPORT OF ASSOCIATE CIVIL ENGINEER OF SEWERAGE DIVISION

DAVIS B. KENISTON, *Commissioner, Metropolitan District Commission:*

DEAR SIR:—The following report of the operations of the Metropolitan Sewerage Division for the year ending December 31, 1933, is respectfully submitted:

ORGANIZATION

The Director and Chief Engineer has charge of the design and construction of all new works, and of the maintenance and operation of all the works controlled by the Metropolitan District Commission for removing the sewage from the thirty-three municipalities which comprise the Metropolitan Sewerage Districts.

The following assistants have been employed during the year:

Henry T. Stiff, Associate Civil Engineer, in charge of office and drafting room and of the construction work.

Ralph W. Loud, Senior Civil Engineer, in charge of construction in field in connection with the New Neponset Valley Sewer, High-Level Sewer Extension and Mill Brook Valley Sewer.

Charles F. Fitz, Assistant Civil Engineer, in charge of maintenance studies and of the maintenance construction work on the North Metropolitan System.

Nathan Levy, Assistant Civil Engineer, in charge of survey work and field work in connection with the construction of Section 121 of the New Neponset Valley Sewer.

Benjamin Rubin, Assistant Civil Engineer, in charge of construction in field in connection with the Braintree-Weymouth Sewer.

Seth Peterson, Superintendent, North Metropolitan Sewerage District.

Forrest F. Harbour, Superintendent, South Metropolitan Sewerage District.

In addition to the above, the maximum number of engineering and other assistants employed during the year was 34, which includes 2 assistant engineers, 8 instrumentmen, 1 supervising sewer construction inspector, 6 inspectors, 1 draftsman, 13 rodmen and engineering assistants, 1 chauffeur and 2 stenographers.

Frederick D. Smith, Director and Chief Engineer of Sewerage Division, ended his service with the Commission on November 9, 1933, having reached the retirement age, in accordance with the laws of the Commonwealth.

He began his career with the Metropolitan Sewerage Commissioners in 1893, and was employed as assistant on the construction of the outfall works at Deer Island. He showed marked ability as a construction engineer and advanced rapidly in the service. As Assistant Engineer and later, Division Engineer, he was brought into intimate contact with all the extensions of the Metropolitan Sewerage Works.

Upon the resignation of William M. Brown, Mr. Smith was appointed Engineer of Sewerage Works on February 28, 1912, and in May, 1916, the title was changed to Chief Engineer of Sewerage Works. The Metropolitan District Commission appointed him Director, with the approval of the Governor and Council, and Chief Engineer of Sewerage Division in December, 1919. His comprehensive knowledge of both the construction and maintenance of the Sewerage works made him of inestimable value to the Commonwealth. The Metropolitan system of sewers, with its pumping stations and outfall works, stands as a lasting tribute to his engineering skill, executive ability, and sterling character.

METROPOLITAN SEWERAGE DISTRICTS

AREAS AND POPULATIONS

During the year no additions to the area of the Metropolitan Sewerage Districts have been made.

The populations of the districts, as given in the following table, are based on the census of 1930.

Table showing Ultimate Contributing Areas and Present Estimated Populations within the Metropolitan Sewerage Districts, as of December 31, 1933

	CITY OR TOWN	Area (Square Miles)	Estimated Population
North Metropolitan District	Arlington	5.20	43,190
	Belmont	4.66	25,870
	Boston (portions of)	3.45	95,070
	Cambridge	6.11	116,600
	Chelsea	2.24	48,020
	Everett	3.34	52,420
	Lexington ¹	5.11	6,460
	Malden	5.07	63,010
	Medford	8.35	67,790
	Melrose	3.73	25,200
	Reading	9.82	10,650
	Revere	5.86	38,740
	Somerville	3.96	108,240
	Stoneham	5.50	10,590
	Wakefield	7.65	17,080
	Winchester	5.95	13,490
	Winthrop	1.61	17,530
	Woburn	12.71	19,850
		100.32	779,800
South Metropolitan District	Boston (portions of)	24.96	401,635
	Braintree	13.44	17,600
	Brookline	6.81	52,120
	Canton	17.84	5,820
	Dedham ¹	9.40	14,700
	Milton	12.59	18,980
	Needham	12.50	12,030
	Newton	16.88	72,270
	Norwood	10.16	15,710
	Quincy	12.56	79,670
	Stoughton	16.23	8,470
	Walpole	20.54	7,840
	Waltham ²	13.63	43,750
	Watertown	4.04	40,010
	Wellesley	9.89	12,920
	Weymouth	16.46	22,030
		217.93	825,555
	Totals	318.25	1,605,355

¹Part of town.

²Including 1806 in the Metropolitan State Hospital and the Middlesex County Tuberculosis Hospital, authorized by Chapter 372 of the Acts of 1928 and Chapter 373 of the Acts of 1929.

Metropolitan Sewers

SEWERS PURCHASED AND CONSTRUCTED AND THEIR CONNECTIONS

During the year there have been 2.707 miles of Metropolitan sewers built within the sewerage districts, so that there are now 142.479 miles of Metropolitan sewers. Of this total, 9.642 miles of sewers, with the Quincy Pumping Station, have been purchased from cities and towns of the districts. The remaining 132.837 miles of sewers and other works have been constructed by the Metropolitan Boards.

The locations, lengths and sizes of these sewers are given in the following tables, together with other data referring to the public and special connections with the systems.

NORTH METROPOLITAN SEWERAGE SYSTEM

Location, Length and Sizes of Sewers, with Public and Special Connections

CITY OR TOWN	SIZE OF SEWERS	Length in Miles	Public Connections, December 31, 1933	SPECIAL CONNECTIONS		Number in Operation
				Character or Location of Connection		
Boston:						
Deer Island	4'0" to 9'0"	1.653	4	Doctor's House		1
East Boston	9'0" to 1'0"	5.467	25	Shoe Factory		1
Charlestown	6'7" x 7'5" to 1'0"	3.292	15	Middlebrook Wool-combing Co.		1
Winthrop	9'0"	2.864	14	Navy Yard		9
Chelsea	8'4" x 9'2" to 15"	5.230	14	Private building		1
Everett	8'2" x 8'10" to 4'8" x 5'1"	2.925	10	H. P. Hood & Sons, Inc. . . .		1
Lexington ¹	1'3"	-	1	Club House		1
Malden	4'6" x 4'10" to 1'0"	5.844 ²	36	Fire Department station		1
Melrose	4'6" x 4'10" to 10"	6.099 ⁴	42	Private building		1
Cambridge	5'2" x 5'9" to 1'3"	7.899	53	Factory		1
Somerville	6'5" x 7'2" to 10"	3.577	16	Railroad station		1
				Park Department bath-house		1
				Harvard dormitories		2
				Slaughterhouse		1
				City Hospital		3
				Street Railway machine shop		1
				Private buildings		3
				Factory building		1
				Tannery		1
				Slaughterhouses (3)		1
				Carhouse		1
				Somerville Water Works blow-off		1
				Street railway power house		1
				Stable		1
				Rendering works		1
				Railroad scale pit		1
				Private building		1

¹The Metropolitan Sewer extends but a few feet into the town of Lexington.²Includes 1.84 miles of sewer purchased from the city of Malden.³Mostly buildings connected with sewers formerly belonging to city of Malden but later purchased by the Metropolitan Sewerage Commission in accordance with Chapter 215 of the Acts of 1898 and by the Metropolitan Water and Sewerage Board in accordance with Chapter 512 of the Acts of 1911 and made parts of the North Metropolitan Sewerage System.⁴Includes 0.736 of a mile of sewer purchased from the city of Melrose.⁵Mostly buildings connected with a sewer formerly belonging to the city of Melrose but later purchased by the Metropolitan Sewerage Commission in accordance with Chapter 414 of the Acts of 1896 and with a sewer extension built in accordance with Chapter 436 of the Acts of 1897 by the Metropolitan Sewerage Commission as an outlet for part of the town of Stoneham and made parts of the North Metropolitan Sewerage System.

NORTH METROPOLITAN SEWERAGE SYSTEM — Concluded
Location, Length and Sizes of Sewers, with Public and Special Connections—
Concluded

CITY OR TOWN	SIZE OF SEWERS	Length in Miles	Public Connec-tions Decem-ber 31, 1933	SPECIAL CONNECTIONS	
				Character or Location of Connection	Number in Operation
Medford . .	6'0" x 6'3" to 10"	7.530	28	Armory building Private buildings Stable Police substation Tanneries Private buildings Gelatine factory Watch-hand factory Stable Railroad station Felt works Town Hall Bay State Saw & Tool Co. Whitney Machine Co. Metropolitan Sewerage Division Water and Sewer Department	1 9 1 1 6 12 1 1 1 3 1 1 1 1 1 1 1
Winchester . .	4'6" to 1'3"	10.420 ¹	34	Glue factory Private building Private buildings Railroad station Car house Post office Town of Arlington garage Town of Arlington workshop The Theodore Schwamb Co., Inc. Arlington Gas Light Co. Edison Transformer Station Arlington High School Laundry	4 1 236 ² 1 3 1 1 1 1 1 1 1 1
Stoneham . .	1'8" to 10"	2.333	10	—	—
Woburn . .	2'6" x 2'7" to 1'3"	1.186	4	—	—
Arlington . .	3'0" x 3'6" to 10"	6.671 ¹	66	—	—
Belmont . .	1'3" to 2'6"	0.008	5	—	—
Wakefield . .	3'0" to 2'0" x 2'3"	0.703	1	Private building	1
Revere . .	4'0" to 15"	0.136	3	—	—
Reading . .	1'4" to 3'0"	0.055	1	—	—
		73.892 ³	382		736

¹Includes 2.631 miles of sewer purchased from the town of Arlington.

²Mostly buildings connected with a sewer formerly belonging to the town of Arlington but later purchased by the Metropolitan Sewerage Commission in accordance with Chapter 520 of the Acts of 1897 and made a part of the North Metropolitan Sewerage System.

³Includes 2.787 miles of Old Mystic Valley Sewer in Medford and Winchester, running parallel with the Metropolitan Sewer.

SOUTH METROPOLITAN SEWERAGE SYSTEM
Location, Length and Sizes of Sewers, with Public and Special Connections

CITY OR TOWN	SIZE OF SEWERS	Length in Miles	Public Connec-tions Decem-ber 31, 1933	SPECIAL CONNECTIONS	
				Character or Location of Connection	Number in Operation
Boston: Back Bay . .	6'6" to 3'9"	1.500 ¹	17	Tufts Medical School Private house Administration Building, Bos-ton Park Department Simmons College Buildings Art Museum Prince District Elementary School Private building Abattoir Boston & Albany Railroad yard	1 1 1 1 2 1 2 3 2
Brighton . .	7'0" to 12"	6.405 ²	16		

¹Includes 0.355 of a mile of sewer purchased from the city of Boston.

²Includes 0.446 of a mile of pipe and concrete sewers built for the use of the city of Boston; also 0.026 of a mile of sewer purchased from the town of Watertown.

SOUTH METROPOLITAN SEWERAGE SYSTEM — Concluded

Location, Length and Sizes of Sewers, with Public and Special Connections — Concluded

CITY OR TOWN	Size of Sewers	Length in Miles	Public Connec-tions, Decem-ber 31, 1933	SPECIAL CONNECTIONS	
				Character or Location of Connection	Number in Operation
Dorchester .	3' x 4' to 2'6" x 2'7"	2.870 ¹	14	Chocolate works . . . Machine shop . . . Paper Mill . . . Private buildings . . . Edison Electric Company Sta-tion . . . Mattapan Paper Mills . . . Private buildings . . . Fairview Cemetery buildings . . .	2 1 1 4 1 2 2 1
Hyde Park .	10'7" x 11'7" to 4'0" x 4'1"	4.527	19		
Roxbury .	6'6" x 7' to 4'0"	1.430	-		
West Roxbury	9'3" x 10'2" to 12"	7.643	26		
Brookline .	6'6" x 7'0" to 8"	2.540 ²	14		
Dedham .	4' x 4'1" to 2'9" x 3'	5.012	10		
Hull ³ .	60" Pipe . . .	0.750	-		
Milton .	11' x 12' to 8"	7.084	33		
Newton .	5'3" x 5'6" to 1'3"	2.912	12		
Quincy .	11'3" x 12'6" to 16" pipe	8.738	28		
Waltham.	3'6" x 4'0"	0.001	1		
Watertown .	4'2" x 4'9" to 12"	0.750 ⁴	8		
Needham .	2'0" x 2'3" to 2'3" x 2'6"	4.921	1		
Wellesley ⁵ .	2'0" x 2'3"	-	1		
Canton .	4'6" x 5'0" to 20"	7.243	4		
Norwood .	4'0" x 4'3" to 30" pipe	2.844	2		
Stoughton ⁶ .	- - -	-	-		
Walpole ⁶ .	- - -	1	-		
Braintree .	30" pipe . . .	0.071	1	- - -	- - -
Weymouth .	4'9" x 5'0" to 30" pipe	1.346	-	- - -	- - -
		68.587	208		88

¹Includes 1.24 miles of sewer purchased from the city of Boston.²Includes 0.158 of a mile of pipe sewer built for the use of the town of Brookline.³Hull is not a part of the Metropolitan Sewerage District.⁴Includes 0.025 of a mile of sewer purchased from the town of Watertown.⁵The Metropolitan Sewer extends but a few feet into the towns of Wellesley, Walpole, and Stoughton.

Information relating to areas, populations, local sewer connections and other data for the Metropolitan sewerage districts appears in the following table:

North Metropolitan Sewerage District

Area (Square Miles)	Estimated Total Population	Miles of Local Sewer Connected	Estimated Population Contributing Sewage	Ratio of Contributing Population to Total Population (Per Cent)	Connections Made with Metropolitan Sewers	
					Public	Special
100.32	779,800	978.45	727,850	93.3	382	736

South Metropolitan Sewerage District

217.93	825,555	1,029.53	614,690	74.5	208	88
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Both Metropolitan Sewerage Districts

318.25	1,605,355	2,007.98	1,342,540	83.6	590	824
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Of the estimated gross population of 1,605,355 on December 31, 1933, 1,342,540, representing 83.6 per cent, were on that date contributing sewage to the Metropolitan sewers, through a total length of 2,007.98 miles of local sewers owned by the individual cities and towns of the districts.

These sewers are connected with the Metropolitan Systems by 590 public and 824 special connections. During the current year there has been an increase of 38.35 miles of local sewers connected with the Metropolitan Systems, and 11 public and 8 special connections have been added.

CONSTRUCTION

North Metropolitan Sewerage System

EXTENSION OF MILL BROOK VALLEY SEWER IN ARLINGTON

The Legislature by Chapter 281 of the Acts of 1933 authorized the completion of the Mill Brook Valley Sewer in Arlington to a short distance beyond the Arlington-Lexington town line.

MILL BROOK VALLEY SEWER — SECTION 83

A contract for the construction of this section of sewer was made, some particulars of which are as follows:

Date of Contract No. 67, (Sewerage Division) July 13, 1933.

Name of Contractor, Zoppo & Civitarese Company, Incorporated.

Length of Section, 2,512 feet.

Length of 20-inch vitrified pipe sewer, 2,510 feet.

Length of excavation in rock trench, 860 feet.

Depth of sewer in trench, from 7 feet to 15 feet.

Assistant Engineer in immediate charge of the section, Ralph W. Loud.

Work was begun on July 19, 1933, and during the remaining portion of the year 2,264 feet of trench have been excavated and 2,226 feet of 20-inch vitrified pipe have been laid. The excavation was largely in earth cut except for a portion at the upper end of the work from Station 18 + 75 to Station 22 + 64 which was in rock open cut. The sewer extends a short distance into the Town of Lexington. This section of the Metropolitan sewer will be completed early in January.

South Metropolitan Sewerage System

NEW NEPONSET VALLEY SEWER

The entire line of the New Neponset Valley Sewer extending from Brook Road in Milton to the town lines of Walpole and Stoughton was completed

before January 1, 1933, with the exception of Section 121, which extends from Washington Street in Canton to the Canton-Stoughton town line. Notice was given by the Commission to Canton and Stoughton that the New Neponset Valley Sewer had been completed and use could be made of the same after July 1, 1933. The towns of Norwood, Walpole and Canton have made connections with the New Neponset Valley Sewer, but up to the present date no connection has been made for the Town of Stoughton.

NEW NEPONSET VALLEY SEWER—SECTION 121

This section was started in the year 1932 and some particulars of the work were given in the report for that year. Work on this section was completed in June of this year, 420 feet of sewer in tunnel near Washington Street, 870 feet of 27-inch by 36-inch concrete sewer and 4,192 feet of 20-inch vitrified pipe sewer having been constructed. The excavation for the portion of the sewer in tunnel near Washington Street was wholly in rock. Along the shore of Bolivar Pond extending from Bolivar Street southerly, a deep cut through the rock was necessary for a distance of about 1,800 feet, the remainder of the section being built through low meadow lands along the westerly shore of Bolivar Pond. No difficulties other than those due to the deep excavation in rock were encountered. The sewer extends a short distance into the Town of Stoughton.

HIGH-LEVEL SEWER IN BRIGHTON AND NEWTON—SECTION 87

This extension of the High-Level Sewer was authorized by the Legislature in 1932 and was outlined in detail in the report of that year. Particulars of this section are contained in the report of 1932. Work was begun on January 12, 1933, and 132 feet of sewer in open cut and 1,828 feet of sewer in earth and rock tunnel were built. The compact nature of the soil in the tunnel allowed excavation to be carried on without great difficulty. At the upper portion of the section, the tunnel bore was partly in slaty rock which required little blasting, the rock face being of a seamy nature. This work was completed on August 28, 1933, and was opened for the service of the City of Newton on that date.

BRAINTREE-WEYMOUTH BRANCH

All the contracts for this branch sewer had been let in previous years and particulars of the uncompleted sections which were in progress during 1932 are contained in the report of that year.

The Commission notified the towns of Braintree and Weymouth on December 6, 1933, that the Braintree-Weymouth Branch Sewer was completed and that the sewage of these towns could be disposed of through the South Metropolitan Sewerage System. The Town of Braintree, having made formal application dated August 9, 1933, to connect with the system, was duly connected on December 11, 1933.

BRAINTREE-WEYMOUTH BRANCH—SECTION 124

Work on this section has been continued during the year and 290 feet of sewer in open cut and 1,350 feet of sewer in earth tunnel were completed on October 24, 1933. A description of the work and the difficulties which were encountered in the driving of this tunnel are mentioned in the report of 1932.

BRAINTREE-WEYMOUTH BRANCH—SECTION 122

Work has been continued on this section and during the year, 2,854 feet of 5-feet by 5-feet 3-inch concrete sewer and 2,675 feet of 4-feet 9-inch by 5-feet concrete sewer have been completed. Most of this sewer was built in fine sands except for a portion of the line crossing Rock Island Cove which required a pile foundation for about 582 feet. A very soft marsh was encountered bordering on the northerly side of Rock Island Cove which delayed the progress of the work. Between Station 21 +0 and Station 28 +0 the

excavation was done largely by hand methods. The contract was finished on October 14, 1933.

BRAINTREE-WEYMOUTH PUMPING STATION — QUINCY

Bids were received for the construction of the foundations and sub-structure work at this station in Quincy on December 29, 1932, and the work was awarded to Louis Balboni. Some particulars of this work are as follows:

Date of Contract No. 63, (Sewerage Division) January 5, 1933.
 Name of Contractor, Louis Balboni.
 Dimensions of sewage pump well, 10 feet 6 inches by 42 feet 10 inches.
 Depth of excavation for pump well, 24 feet.
 Depth of excavation for building foundations, 7 feet.
 Length of 30-inch cast-iron force main, 61 feet.
 Length of concrete connecting sewers, 167 feet.
 Dimensions of connecting sewers, 5 feet by 5 feet 3 inches and 2 feet 6 inches by 2 feet 9 inches.

Assistant Engineer in immediate charge of the section, Benjamin Rubin. Work was begun on January 16, 1933, and the foundations for the pumping station were completed on May 15, 1933. The connecting sewers and the force main were completed on July 21, 1933. The excavation for the pump well and building foundations was largely in sandy clay. No difficulties were encountered in building these foundations. The 2 feet 6 inch by 2 feet 9 inch concrete connecting sewer was built for the use of the City of Quincy and passed in tunnel under the main High-Level Sewer which at this point was in embankment. A very fine sand mixed with clay was encountered in driving the tunnel under the High-Level Sewer. On account of the presence of ground waters in the soil, the sewer was encased in a tight wooden box composed of 3-inch tongued and grooved sheeting. This box was driven in from the face of the heading and excavation was carried on inside the box in the usual manner of tunnel excavation. A 4-inch City water supply main was laid alongside this connecting sewer from an existing main on the northerly side of the High-Level Sewer embankment. This 4-inch main supplies water for use in the pumping station.

BRAINTREE-WEYMOUTH BRANCH RIPRAP REINFORCEMENT

In order to complete the construction work on Section 125, a contract was made for riprap reinforcement and valve manhole around the head house on the Braintree side of the siphon crossing Weymouth Fore River. This work was let as a lump sum contract, some particulars of which are as follows:

Date of Contract No. 68, (Sewerage Division) November 29, 1933.
 Name of Contractor, A. C. Trojano.
 Assistant Engineer in immediate charge of construction, Benjamin Rubin.
 The Contractor began work on December 5, 1933, and it is expected that the work will be completed early in January, 1934.

BRAINTREE-WEYMOUTH PUMPING STATION BUILDING

A contract was let dated April 27, 1933, for constructing the building to M. Spinelli & Sons Company, Incorporated. The work of erecting the building was begun under this contract on June 1, 1933, the work having been delayed by the sub-contractor for the granite foundation course. The contract was completed and the building was turned over to the use of the Sewerage Division on October 11, 1933.

PUMPING EQUIPMENT FOR BRAINTREE-WEYMOUTH PUMPING STATION

A contract for furnishing and erecting the pumping machinery for this station was placed with the Turbine Equipment Company of New England on August 18, 1932. On account of the delay in having the pumping station ready for use, the erection of this machinery was not begun until July, 1933.

The Contractor finished the work of the erection of the pumps and accessories on October 30, 1933, and turned the plant over to the Sewerage Division formally on that date.

MAINTENANCE

SCOPE OF WORK AND FORCE EMPLOYED

The maintenance of the Metropolitan Sewerage System includes the operation of 10 pumping stations, the Nut Island screen-house and 142.479 miles of Metropolitan sewers, receiving the discharge from 2,007.98 miles of town and city sewers at 1,414 points, together with the care and study of inverted siphons under streams and in the harbor.

At present the permanent maintenance force consists of 196 men, of whom 117 are employed on the North System and 79 on the South System. These are subdivided as follows; North Metropolitan System, 74 engineers and other employees in the pumping stations and 43 men, including foreman, on maintenance, care of sewer lines, buildings and grounds; South Metropolitan System, 49 engineers and other employees in the pumping stations and 30 men, including foremen, on maintenance, care of sewer lines, buildings and grounds.

The regular work of this department, in addition to the operation of the pumping stations, has consisted of routine work of cleaning and inspecting sewers and siphons, caring for tide gates, outfall sewers, regulators and overflows, measuring flow in sewers, inspection of connections to the Metropolitan sewers, and the care of pumping stations and other buildings, grounds and wharves.

In addition to these regular duties, other work has been done by the maintenance employees in this department as follows:

EAST BOSTON PUMPING STATION

Most of the machine work in connection with the maintenance and repairs of the pumping units of the North Metropolitan Sewerage Pumping Stations is done at the general machine shop at this station.

An Ames engine and generator was purchased in February, 1933, from the State Department of Mental Diseases and the work of erecting this unit is now being done by the maintenance forces. New pistons and rods for both the high pressure and intermediate pressure cylinders on engine No. 4 at this station were installed by the maintenance forces. A new high pressure steam cylinder with liner, new piston, piston rod and valves for engine No. 1 at this station were installed by the maintenance forces.

The lightning rod on the south chimney at this station was repaired by placing new bands, holders and points. The tile roofs which were originally laid over the engine room, machine shop and office at this station were removed and new roofs were laid consisting of built up asbestos and asphalt layers mopped together. The steel doors which were placed in the building when it was rebuilt after the Chelsea fire, having become badly corroded, were replaced with new doors consisting of a wood core covered with lead plated copper. These doors were located on the south side of the building. A contract for furnishing these doors was made on November 8, 1933, with the George T. McLauthlin Company, and the repairs to the chimney and roofs were done by a private contracting firm.

DEER ISLAND PUMPING STATION

The copper valleys on all of the dormer windows of this station building were renewed by 20-ounce copper. This was found necessary because the original valleys which were placed in 1894 when the station was built were found to be badly corroded. Extensive repair work was also done to the roof of the coal pocket building, boiler and engine house. This work was done by a private contracting firm.

A new high pressure steam cylinder with liner, new piston, piston rod and valves for engine No. 2 at this station were installed by the maintenance forces.

CHARLESTOWN PUMPING STATION

The chimney at this station was repointed with Portland cement from the top of the chimney down a distance of 20 feet. The cast-iron cap of the chimney was scraped and repainted and new bolts supplied. Repairs were made on the lightning rod of this chimney, new points, cable and fasteners being installed. This work was done by the Boston Lightning Rod Company.

ALEWIFE BROOK PUMPING STATION

A contract was made with the International Engineering Works, Incorporated, for furnishing and erecting two vertical internally fired boilers which replaced two other boilers discarded because of reduction of allowable pressure. These boilers were built larger than those replaced and are operated under 150 pounds pressure.

CROSS STREET MAINTENANCE YARD, WINCHESTER

Adjoining the present holdings of the Sewerage Division on Cross Street, Winchester, a lot of land containing about 8,500 square feet was purchased from the Moore Securities Company of Philadelphia, Pennsylvania. This will supply a much needed area at this yard to be used for storage and disposal of waste material.

WARD STREET PUMPING STATION

Skylights were installed in the roof of the valve room in the basement of this station and the balance of the roof was made tight by an asphalt coating. A new roof was installed over the boiler room and office building consisting of built-up asphalt and asbestos, the layers being mopped together with hot asphalt. The copper roof over the economizer building was also replaced. This work was done by private contracting firms.

QUINCY PUMPING STATION

The 4-inch steam main at this station was replaced by a new main, the old main which was installed at the time the building was erected in 1898 having become badly corroded. This work was done by the maintenance forces.

A new system of ventilation to increase the circulation of air in the screen chamber at this station was installed and was connected with the chimney draft. The copper valleys at this station, which was constructed in 1898, had become so badly corroded that it was necessary to renew them and new valleys were built with 20-ounce copper. All this work was done by a private contracting firm.

NUT ISLAND SCREEN-HOUSE

At this station repairs were made to the roof and the copper work and new slate were placed where needed.

WEST STREET MAINTENANCE YARD, HYDE PARK

Adjoining the present holdings of the Sewerage Division on West Street, a lot of land containing about 10,000 square feet was purchased from William B. Harlow by deed dated November 22, 1933. This purchase makes a much needed addition to the present yard and will be used for maintenance purposes.

GASOLENE IN PUBLIC SEWERS

During the year the usual precautions have been maintained against the introduction of gasolene into the Metropolitan sewers. An inspector who covers both North and South Metropolitan Sewerage Districts has been employed. His duties are to see that all newly constructed garages or other

gasolene-using establishments are supplied with a proper gasolene separator and also to see that these separators are kept in working condition.

During the year 1933 the number of permits issued by the municipalities in the Sewerage Districts for the construction of garages and other places where gasolene is used was 249. Each of these permits necessitates an examination by our inspector. Many of them are attended to through the mails and do not require a personal visit. Visits are made, however, to all locations where a connection is to be made with the public sewerage system and to such places as do not respond to the return postal cards sent out. During the year 18 such places were connected with the sewers that empty into the Metropolitan Systems. At the present time, there are, according to our records, 1,649 garages and other establishments where gasolene is used connected with the local sewerage systems which discharge into the Metropolitan sewers.

This system of inspection has improved the gasolene situation in regard to the danger to the sewers. Occasionally odors of gasolene are detected in the sewers. These are reported to the Public Safety Department which alone has statutory control of the distribution and handling of gasolene in the Commonwealth.

NORTH METROPOLITAN SEWERAGE SYSTEM

Table showing Cities and Towns delivering Sewage to this System; Approximate Miles of Sewers connected; Estimated Populations and Areas now contributing; Total Areas ultimately to contribute, and Present Populations on Such Areas; Ratios of Present Contributing Areas to Ultimate Areas, and Ratios of Populations now contributing to Present Total Populations.

(Populations estimated as of December 31, 1933)

CITIES AND TOWNS	Miles of Local Sewers Connected	Miles of Local Sewers Separately or Combined	Number of Connections with Local Sewers	Estimated Number of Persons Served by Each House Connection ¹	Estimated Population Now Contributing Sewage	Estimated Present Total Population	Estimated Area Now Contributing Sewage	Area Ultimately to Contribute Sewage	Ratio of Population to Present Total Population	Ratio of Contributing Area to Ultimate Area	Per Cent.
Boston (Deer Island)	0.70	Separate	3,861	4.5	920 ²	920	17,370	1,41	1.61	99.1	—
Winthrop	33.30	Separate	5,528	10.6	58,600	61,400	1,26	1,26	2.18	95.4	87.6
Boston (East Boston)	35.69	Separate and combined	4,855	9.7	47,090	48,020	1,22	2.24	2.24	98.1	57.8
Chelsea	32.88	Separate and combined	6,687	7.7	51,490	52,420	2.15	3.34	3.34	98.2	54.5
Everett	53.46	Separate and combined	9,500	6.5	61,750	63,010	3.50	5.07	5.07	98.2	64.4
Malden	79.20	Separate	5,073	4.8	24,350	25,200	2.27	3.73	3.73	98.1	69.0
Melrose	51.20	Separate	5,605	5.8	32,510	32,750	0.67	1.27	1.27	96.6	60.9
Boston (Charlestown)	22.04	Separate and combined	19,148	6.05	115,850	116,600	5.17	6.11	6.11	99.3	52.8
Cambridge	164.85	Separate and combined	17,947	6.0	107,680	108,240	3.67	3.96	3.96	99.4	84.6
Somerville	106.43	Separate and combined	10,741	6.25	67,130	67,790	4.37	8.35	8.35	99.5	92.7
Medford	94.39	Separate	2,968	4.45	13,240	13,490	2.02	5.95	5.95	99.0	52.3
Winchester	42.98	Separate	1,706	5.6	9,550	19,850	1.19	12.71	12.71	98.1	33.9
Woburn	23.19	Separate	1,549	4.5	6,970	10,590	1.03	5.50	5.50	94.1	9.4
Stoneham	20.51	Separate	6,147	6.2	38,110	43,190	2.92	5.20	5.20	88.2	18.7
Arlington	62.32	Separate	3,486	7.0	24,400 ³	25,870	2.21	4.66	4.66	94.3	56.2
Belmont	47.74	Separate	1,708	5.1	8,710	17,080	1.11	7.65	7.65	94.3	47.4
Wakefield	26.47	Separate	751	4.2	3,150 ⁴	6,460	0.95	5.11	5.11	48.8	14.5
Lexington	16.95	Separate	5,334	6.9	36,800	38,740	2.49	5.86	5.86	95.0	18.6
Revere	53.10	Separate	518	4.2	2,180	10,650	0.53	9.82	9.82	20.5	42.5
Reading	11.05	Separate	—	—	—	—	—	—	—	—	5.4
Totals	978.45	—	—	113,112	6.4	727,850	779,800	40.14	100.32	93.3	40.01

¹Estimated from Assessors' statement of the number of houses in each city or town on April 1, 1933 and the population from census of 1930.²Estimated by Superintendent of the Institution on Deer Island.³Including 2 connections with McLean Hospital, having an estimated population of 667.⁴Part of town not included in Metropolitan Sewerage District.

SOUTH METROPOLITAN SEWERAGE SYSTEM

Table showing Cities and Towns delivering Sewage to this System; Approximate Miles of Sewers connected; Estimated Populations and Areas now contributing, Total Areas ultimately to contribute, and Present Populations on Such Areas; Ratios of Present Contributing Areas to Ultimate Areas and Ratios of Populations now contributing to Present Total Populations.

(Populations estimated as of December 31, 1933)

CITIES AND TOWNS	Miles of Local Sewers Connected	Miles Separate or Combined	Number of Connections with Local Sewers	Estimated Number of Persons Served by Each House Connection ¹	Estimated Population Now Contributing Sewage	Estimated Present Total Population	Estimated Area Now Contributing Sewage	Area Ultimately to Contribute Sewage	Ratio of Contributing Population to Present Total Population	Per Cent.	Ratio of Contributing Area to Ultimate Area	Per Cent.	
Boston (Back Bay)	27.84	Separate and combined	2,243	19.7	44,190	44,480	Sq. Miles 1.17	Sq. Miles 3.74	Per Cent. 99.3	Per Cent. 72.7			
Boston (Brighton)	74.64	Separate and combined	5,993	10.4	62,330	62,730	3.40	3.40	99.4	99.4	90.9		
Brookline	92.91	Separate and combined	7,213	7.15	51,650	52,120	4.21	6.81	99.1	99.1	61.8		
Newton	183.65	Separate	12,919	5.5	71,050	72,270	9.30	16.88	98.3	98.3	55.1		
Watertown	66.84	Separate	6,050	6.5	39,330	40,010	2.93	4.04	98.3	98.3	72.5		
Waltham	63.92 ²	Separate	5,273	7.85	43,200 ³	43,750 ⁴	3.59	13.63	98.7	98.7	26.3		
Boston (Dorchester)	73.80	Separate and combined	8,378	11.1	93,150 ²	133,515 ²	2.96	4.89	69.8	69.8	60.5		
Milton	33.04	Separate and combined	2,619	4.8	12,570 ²	18,980 ²	1.43	12.59	66.2	66.2	11.4		
Boston (Hyde Park)	43.71	Separate	3,458	8.6	29,740	29,990	1.96	4.57	99.2	99.2	42.9		
Dedham	22.85	Separate	1,448	4.8	6,950	14,700 ³	1.10	9.40	47.3	47.3	11.7		
Boston (Roxbury) ⁴	-	-	-	-	-	53,590 ²	-	1.23	-	-	-	-	
Boston (West Roxbury)	98.12	Separate and combined	7,799	7.5	58,600 ² ⁵	77,330 ²	3.85	8.92	75.8	75.8	43.2		
Quincy	143.61	Separate	12,834	6.1	78,290	79,670	5.54	12.56	98.3	98.3	44.1		
Wellesley	37.25	Separate	1,623	4.2	6,820	12,920	2.10	9.89	52.8	52.8	21.2		
Needham	17.58	Separate	542	4.4	2,380	12,030	0.84	12.50	19.8	19.8	6.7		
Canton	3.10	Separate	110	4.3	470	5,820	0.14	17.84	8.1	8.1	0.8		
Norwood	30.09	Separate	2,080	6.1	12,690	15,710	1.62	10.16	80.8	80.8	15.9		
Stoughton	-	Separate	-	-	-	8,470	-	16.23	-	-	-	-	
Walpole	3.13	Separate	-	4 ⁸	1,280 ⁸	7,840	0.05	20.54	16.3	16.3	0.2		
Braintree	13.45	Separate	-	-	-	17,600	0.62	13.44	-	-	4.6		
Weymouth	-	-	-	-	-	22,030	-	16.46	-	-	-	-	
Totals	. . .	1,029.53	- - -	- - -	80,586	7.6	614,690	825,555	46.81	217.93	74.5	21.5	

¹Estimated from Assessor's statement of the number of houses in each city or town on April 1, 1933, and the population from census of 1930.
²Parts of Dorchester, Milton, Roxbury and West Roxbury which are situated within the South Metropolitan Sewerage District limits are tributary at present to Boston main drainage works.

³Part of town not included in Metropolitan Sewerage District.

⁴At present connected with institution at Austin Farm, having an estimated population of 2,645.

⁵Including connections with the Metropolitan State Hospital and the Middlesex County Tuberculosis Hospital, authorized by chapter 372 of the Acts of 1928 and chapter 373 of Acts of 1929, having an estimated population of 1,806.

⁶Includes 3.65 miles of trunk sewer built by Waltham, Watertown, Metropolitan State Hospital, and Middlesex County Tuberculosis Hospital, authorized by Chapter 372 of the Acts of 1928 and Chapter 373 of the Acts of 1929.

⁸Manufacturing plants.

Both METROPOLITAN SEWERAGE SYSTEMS

Table showing Areas delivering Sewage to both Systems; Approximate Miles of Sewers connected; Estimated Populations and Areas now contributing; Total Areas ultimately to contribute, and Present Populations on Such Areas. Ratios of Present Contributing Areas to Ultimate Areas, and Ratios of Populations now contributing to Present Total Populations.

(Population estimated as of December 31, 1933)

SYSTEMS	Miles of Local Sewers Connected	Number of Con- nections with Local Sewers	Estimated Number of Persons Served by Each House Connection	Estimated Population Now Con- tributing Sewage	Estimated Present Total Population	Estimated Area Now Contri- buting Sewage	Area Ultimate- ly to Contribute Sewage	Ratio of Contributing Population to Present Total Population	Ratio of Contributing Area to Ultimate Area	Per Cent. 40.01 21.50
North Metropolitan .	978.45	Separate and combined	113,112	6.4	727,850	779,800	Sq. Miles 100.32	Per Cent. 93.3		
South Metropolitan .	1,029.53	Separate and combined	80,586	7.6	614,690	825,555	217.93	74.5		
Totals . . .	2,007.98	- - -	193,698	7.0	1,342,540	1,605,355	86.95	318.25	83.6	27.30

PUMPING STATIONS

Capacities and Results

NORTH METROPOLITAN SYSTEM

Deer Island Pumping Station

At this station are four submerged centrifugal pumps with impeller wheels 8.25 feet in diameter, driven by triple-expansion engines of the Reynolds-Corliss type.

Contract capacity of 1 pump: 100,000,000 gallons, with 19-foot lift.

Contract capacity of 3 pumps: 45,000,000 gallons each, with 19-foot lift.

Average coal duty for the year: 53,400,000 foot pounds.

Average quantity raised each day: 82,100,000 gallons.

Maximum quantity raised per day: 151,500,000 gallons.

East Boston Pumping Station

At this station are four submerged centrifugal pumps, with impeller wheels 8.25 feet in diameter, driven by triple-expansion engines of the Reynolds-Corliss type.

Contract capacity of 1 pump: 100,000,000 gallons with 19-foot lift.

Contract capacity of 3 pumps: 45,000,000 gallons each, with 19-foot lift.

Average coal duty for the year: 60,700,000 foot pounds.

Average quantity raised each day: 80,100,000 gallons.

Maximum quantity raised per day: 149,500,000 gallons.

Charlestown Pumping Station

At this station are three submerged centrifugal pumps, two of them having impeller wheels 7.5 feet in diameter, the other 8.25 feet in diameter. They are driven by triple-expansion engines of the Reynolds-Corliss type.

Contract capacity of 1 pump: 60,000,000 gallons with 8-foot lift.

Contract capacity of 2 pumps: 22,000,000 gallons each, with 11-foot lift.

Average coal duty for the year: 45,800,000 foot pounds.

Average quantity raised each day: 38,400,000 gallons.

Maximum quantity raised per day: 69,000,000 gallons.

Alewife Brook Pumping Station

The pumping units in this station consist of one Andrews pump driven by a compound marine engine, one Morris pump and Morris compound engine and a specially designed engine of vertical cross-compound type having between the cylinders a centrifugal pump rotating on a horizontal axis.

Contract capacity of the Andrews pump: 4,500,000 gallons with 13-foot lift.

Contract capacity of Morris pump: 8,000,000 gallons with 15-foot lift.

Contract capacity of the special pump: 13,000,000 gallons with 13-foot lift.

Average coal duty for the year: 23,800,000 foot pounds.

Average quantity raised each day: 7,400,000 gallons.

Maximum quantity raised per day: 21,000,000 gallons.

Reading Pumping Station

At this station are two submerged centrifugal pumps, one of 2,500,000 gallons per 24 hours, and one of 4,000,000 gallons per 24 hours, capacity. These operate against a maximum head of 65 feet, and are actuated by vertical shafts directly connected with 75 and 100 horse-power motors. Alternating current of 440 volts furnished by the town of Reading is used.

Average quantity pumped per 24 hours: 1,200,000 gallons.

Maximum quantity raised per day: 3,580,000 gallons.

SOUTH METROPOLITAN SYSTEM

Ward Street Pumping Station

At this station are two vertical, triple-expansion pumping engines, of the Allis-Chalmers type, operating reciprocating pumps, the plungers of

which are 48 inches in diameter with a 60-inch stroke and one 50,000,000-gallon centrifugal pumping unit actuated by a 500 H.P. Uniflow engine. Contract capacity of 3 pumps: 50,000,000 gallons each, with 45-foot lift. Average coal duty for the year: 80,600,000 foot pounds. Average quantity raised each day: 34,600,000 gallons. Maximum quantity raised per day: 69,700,000 gallons.

Quincy Pumping Station

The plant at this station consists of one compound condensing Deane duplex piston pumping unit and one Lawrence centrifugal pump driven by a Sturtevant compound condensing engine and one Morris centrifugal pump driven by a Morris compound condensing engine. Contract capacity of 3 pumps: Morris centrifugal, 10,000,000 gallons; Deane, 5,000,000 gallons; Lawrence centrifugal, 10,000,000 gallons. Average coal duty for the year: 32,700,000 foot pounds. Average quantity raised each day: 8,020,000 gallons. Maximum quantity raised per day: 40,000,000 gallons.

Nut Island Screen-house

The plant at this house includes two sets of screens in duplicate actuated by small reversing engines of the Fitchburg type. Two vertical Deane boilers, 80 horse-power each, operate the engines, provide heat and light for the house, burn materials intercepted at the screens, and furnish power for the Hough's Neck pumping station.

Average daily quantity of sewage passing screens: 84,100,000 gallons. Maximum quantity passing screens per day: 227,000,000 gallons.

Hough's Neck Pumping Station

At this station are two 6-inch submerged Lawrence centrifugal pumps with vertical shafts actuated by two Sturtevant direct-current motors.

The labor and electric energy for this station are supplied from the Nut Island Screen-house, and as used at present it does not materially increase the amount of coal used at the latter station.

Average quantity raised each day: 319,000 gallons. Maximum quantity raised per day: 663,000 gallons.

Squantum Pumping Station

At this station are two pumping units each consisting of a 10-inch submerged DeLaval centrifugal pump with vertical shaft actuated by a Crocker-Wheeler 60 H.P. motor. Each unit is capable of lifting 4,000,000 gallons of sewage per 24 hours against a head of 46 feet.

The electric energy for this station is purchased from the Quincy Electric Light & Power Company.

Average quantity raised each day: 131,100 gallons.

Braintree-Weymouth Pumping Station

At this station are two pumping units consisting of DeLaval centrifugal pumps actuated by 150 H.P. direct connected Diesel-Winton engines, together with all accessories appertaining thereto. Each unit is capable of lifting 15,000,000 gallons of sewage per 24 hours against a head of 30 feet. No sewage has been pumped at this station during the year.

Average Daily Volume of Sewage lifted at Each of the Nine Metropolitan Sewerage Pumping Stations during the Year, as compared with the Corresponding Volumes for the Previous Year

PUMPING STATION	AVERAGE DAILY PUMPAGE			
	Jan. 1, 1933 to Dec. 31, 1933	Jan. 1, 1932 to Dec. 31, 1932	Increase during the Year	
	Gallons	Gallons	Gallons	Per Cent.
Deer Island	82,100,000	82,400,000	300,000*	0.36
East Boston	80,100,000	80,400,000	300,000*	0.37
Charlestown	38,400,000	41,700,000	3,300,000*	7.91
Alewife Brook	7,400,000	6,950,000	450,000	6.47
Reading	1,200,000	1,185,600	15,000	1.27
Quincy	8,020,000	7,940,000	80,000	1.01
Ward Street (actual gallons pumped)	34,600,000	35,200,000	600,000*	1.70
Hough's Neck	319,000	275,000	44,000	16.00
†Squantum	131,100	77,200†	-	-

*Decrease

†Pumping commenced Sept. 12, 1932.

METROPOLITAN SEWERAGE OUTFALLS

The Metropolitan Sewerage Districts now have outfalls in Boston Harbor at five points, two of which may discharge sewage from the North District and three from the South District.

During the year the sewage of the North District has been discharged wholly through the outlet located near Deer Island light. The other outfall of this system is closed by a cast-iron cover which can easily be removed.

Of the outfalls of the South District two extend for a distance exceeding one mile from the shore of Nut Island, Quincy, and the third one, called an emergency outlet, extends about 1,500 feet from the same. It was necessary to discharge sewage through this outfall 383 hours during the year.

An examination of the sewerage outfalls at Deer Island was made in July and they were found to be free from deposits and in good condition. The cast-iron cover plate at the outer end of the emergency outfall was found to be misplaced and was restored to its proper position. This inspection was made by a diver.

During the year the average flow through the North Metropolitan District outfall at Deer Island has been 82,100,000 gallons of sewage per 24 hours, with a maximum rate of 151,500,000 gallons during a stormy period in April, 1933. The amount of sewage discharged into the North Metropolitan District averaged 113 gallons per day for each person, taking the estimated population of the District contributing sewage. If the sewers in this District were restricted to the admission of sewage proper only, this per capita amount would be considerably decreased.

An examination of the sewerage outfalls at Nut Island was made in July and they were found to be free from deposits and in good condition. This inspection was made by a diver.

In the South Metropolitan District an average of 78,200,000 gallons of sewage per 24 hours has passed through the screens at the Nut Island Screen-house and has been discharged from the out-falls into the outer harbor. The maximum rate of discharge per day which occurred during a stormy period in September, 1933, was 227,000,000 gallons. The discharge of sewage through these outfalls represents the amount of sewage contributed by the South Metropolitan District, which was at the rate of 137 gallons per day per person of the estimated number contributing sewage in the District.

MATERIAL INTERCEPTED AT THE SCREENS

The material removed from the sewage at the screens of the North Metropolitan Sewerage Stations, consisting of rags, paper and other floating materials, has during the year amounted to 1,898 cubic yards. This is

equivalent to 1.71 cubic feet for each million gallons of sewage pumped at Deer Island.

The material removed from the sewage at the screens of the South Metropolitan Sewerage Stations amounted to 4,595 cubic yards, equal to 4.04 cubic feet per million gallons of sewage delivered at the outfall works at Nut Island.

Studies of sewage flows in the Metropolitan sewers and siphons indicate that they are free from deposit.

HENRY T. STIFF,
Associate Civil Engineer.

BOSTON, JANUARY 1, 1934.

**FINANCIAL STATEMENT
of the
METROPOLITAN DISTRICT COMMISSION
FOR THE YEAR ENDING NOVEMBER 30, 1933**

	CONDITION OF FUND AS OF DEC. 1, 1932	AMOUNT AVAIL- ABLE 1933	EXPENDED 1933	BALANCE DEC. 1, 1933
Headquarters Building:				
Chapter 362, Acts of 1929	\$750,000.00			
Expended to Dec. 1, 1932	730,494.86			
	<hr/>			
		\$19,505.14	-	\$19,505.14*

Construction

PARKS DIVISION

Metropolitan Parks Construction Fund, Series I	\$9,093,043.96			
Receipts	198,942.81			
	<hr/>			
Expended to Dec. 1, 1932	\$9,291,986.77			
	9,264,144.59			
	<hr/>			
Metropolitan Parks Construction Fund, Series II	\$9,614,780.63			
Receipts	29,934.16			
	<hr/>			
Expended to Dec. 1, 1932	\$9,644,714.79			
	9,642,158.36			
	<hr/>			
Charles River Basin Construction Fund	\$4,500,000.00			
Receipts	9,368.91			
	<hr/>			
Expended to Dec. 1, 1932	\$4,509,368.91			
	4,472,922.22			
	<hr/>			
Northern Traffic Route Construction Fund	\$3,000,000.00			
Receipts	18,140.30			
	<hr/>			
Expended to Dec. 1, 1932	\$3,018,140.30			
	2,952,860.07			
	<hr/>			
Brookline St., Essex St., Cottage Farm Bridge Construction Fund	\$1,850,000.00			
Expended to Dec. 1, 1932	1,760,062.28			
	<hr/>			
Newton-Wellesley Bridge Construction Fund	\$50,000.00			
Receipts (Interest)	1,753.38			
	<hr/>			
Expended to Dec. 1, 1932	\$51,753.38			
	50,000.00			
	<hr/>			
Charles River Basin Improvements, Chapter 371, Acts of 1929	\$2,305,000.00			
Less Chapter 179, Acts of 1931	25,000.00			
	<hr/>			
Expended to Dec. 1, 1932	\$2,280,000.00			
	919,377.56			
	<hr/>			
		\$1,360,622.44	\$594,678.52	\$765,943.92

SEWERAGE DIVISION

Metropolitan Sewerage Construction Fund, North System	\$8,611,521.55			
Receipts	87,514.78			
	<hr/>			
Expended to Dec. 1, 1932	\$8,699,036.33			
	8,654,642.75			
	<hr/>			
Metropolitan Sewerage Construction Fund, South System	\$13,220,151.75			
Receipts	24,599.61			
	<hr/>			
Expended to Dec. 1, 1932	\$13,244,751.36			
	12,533,772.53			
	<hr/>			
		\$710,978.83	\$545,013.11	\$165,965.72

*Reverted

Maintenance — Continued

	CONDITION OF FUND AS OF DEC. 1, 1932	AMOUNT AVAILABLE 1933	EXPENDED 1933	BALANCE DEC. 1, 1933
<i>Parks Division — Continued</i>				
<i>Metropolitan Parks Maintenance Fund, — Continued</i>				
<i>Metropolitan Parks Maintenance Fund, Boulevards:</i>				
General:				
Chapter 174, Acts of 1933		\$540,040.00		
Balance brought forward from 1932 appropriation to cover 1932 expenditures on 1933 books		27,784.61		
			\$567,824.61	\$509,320.89 \$58,503.72
Specials:				
Electric Lighting System				
Balance of Chapters 146 and 386, Acts of 1929		\$4,549.08	\$295.12	\$4,253.96
Extension of Quincy Shore Reservation:				
Chapter 343, Acts of 1927		\$35,000.00		
(Reappropriated Chapter 386, Acts of 1929)				
Expended to Dec. 1, 1932		33,405.18	\$1,594.82	— \$1,594.82
Land for Boulevard along Charles River:				
Chapter 343, Acts of 1927		\$80,000.00		
Chapter 127, Acts of 1928		100,000.00		
Chapter 146, Acts of 1929		200,000.00		
			\$380,000.00	
Expended to Dec. 1, 1932		329,297.19	\$50,702.81	— \$50,702.81
Land, Boulevard, Newburyport Turnpike to Lynn Woods Parkway:				
Chapter 426, Acts of 1930		\$10,000.00		
Expended to Dec. 1, 1932		6,330.97	\$3,669.03	\$227.69 \$3,441.34
Repairing Damages:				
Chapter 189, Acts of 1931		\$15,000.00		
Expended to Dec. 1, 1932		14,949.10	\$50.90	— \$50.90*
Work of Previous Years:				
Chapter 460, Acts of 1931		\$11,700.00		
Expended to Dec. 1, 1932		11,188.09	\$511.91	— \$511.91
Resurfacing Reedsdale and Brook Roads, Milton:				
Chapter 460, Acts of 1931		\$88,513.12		
Expended to Dec. 1, 1932		71,419.98	\$17,093.14	— \$17,093.14*
Reconstruction Alewife Brook Parkway:				
Chapter 460, Acts of 1931		\$100,000.00		
Expended to Dec. 1, 1932		96,111.47	\$3,888.53	\$3,019.07 \$869.46*
Circumferential Highway:				
Chapter 398, Acts of 1926		\$115,000.00		
Chapter 386, Acts of 1929		159,000.00		
Chapter 115, Acts of 1930		371,000.00		
Chapter 460, Acts of 1931		28,947.37		
Chapter 170, Acts of 1932		21,052.63		
			\$695,000.00	
Expended to Dec. 1, 1932		608,635.77	\$86,364.23	\$53,460.21 \$32,904.02
Boulevard, Fellsway to Mystic Avenue, Medford:				
Chapter 460, Acts of 1931		\$189,473.68		
Chapter 170, Acts of 1932		210,526.32		
			\$400,000.00	
Expended to Dec. 1, 1932		22,938.81	\$377,061.19	\$104,629.70 \$272,431.49
Brookline-Newton Boulevard:				
Chapter 460, Acts of 1931		\$231,578.95		
Chapter 170, Acts of 1932		168,421.05		
			\$400,000.00	
Expended to Dec. 1, 1932		76,229.17	\$323,770.83	\$186,872.92 \$136,897.91
Resurfacing Boulevards and Parkways:				
Chapter 174, Acts of 1933		\$100,000.00		
Chapter 371, Acts of 1933		50,000.00		
Balance brought forward from 1932 appropriation to cover 1932 expenditures on 1933 books		36,670.99		
			\$186,670.99	\$164,108.37 \$22,562.62
Reconstruction Nantasket Beach Roadway:				
Chapter 307, Acts of 1932		\$60,000.00		
Expended to Dec. 1, 1932		39,898.07	\$20,101.93	\$20,098.09 \$3.84

*Reverted

Maintenance — Continued

	CONDITION OF FUND AS OF DEC. 1, 1933	AMOUNT AVAILABLE 1933	EXPENDED 1933	BALANCE DEC. 1, 1933
<i>Parks Division — Continued</i>				
<i>Metropolitan Parks Maintenance Fund, Boulevards — Continued</i>				
Brush Cutting, Newburyport Turnpike to Lynn Woods Parkways:				
Chapter 307, Acts of 1932	\$10,000.00			
Expended to Dec. 1, 1932	8,985.80			
		\$1,014.20		
Traffic Circle, Fellsway West:				
Chapter 307, Acts of 1932	\$30,000.00			
Expended to Dec. 1, 1932	13,796.17			
		\$16,203.83	\$11,709.32	\$4,494.51
<i>Charles River Basin Maintenance Fund:</i>				
Chapter 174, Acts of 1933	\$198,746.00			
Balance brought forward from 1932 appropriation to cover 1932 expenditures on 1933 books	1,445.47			
		\$200,191.47	\$183,776.04	\$16,415.43
<i>Nantasket Beach Maintenance Fund:</i>				
Chapter 174, Acts of 1933	\$83,860.00			
Balance brought forward from 1932 appropriation to cover 1932 expenditures on 1933 books	398.49			
		\$84,258.49	\$81,111.47	\$3,147.02
<i>Wellington Bridge Maintenance Fund:</i>				
Chapter 174, Acts of 1933	\$19,816.00			
Balance brought forward from 1932 appropriation to cover 1932 expenditures on 1933 books	38.84			
		\$19,854.84	19,120.34	\$734.50
<i>Bunker Hill Maintenance Fund:</i>				
Chapter 174, Acts of 1933	\$10,730.00			
		\$10,680.98		\$49.02
SEWERAGE DIVISION				
<i>Metropolitan Sewerage Maintenance Fund, North System:</i>				
Chapter 174, Acts of 1933	\$342,975.00			
Balance brought forward from 1932 appropriation to cover 1932 expenditures on 1933 books	15,437.51			
		\$358,412.51	\$313,384.23	\$45,028.28
<i>Metropolitan Sewerage Maintenance Fund, South System:</i>				
Chapter 174, Acts of 1933	\$231,200.00			
Balance brought forward from 1932 appropriation to cover 1932 expenditures on 1933 books	11,514.65			
		\$242,714.65	\$219,851.32	\$22,863.33
WATER DIVISION				
<i>Metropolitan Water Maintenance Fund:</i>				
Chapter 174, Acts of 1933	\$839,480.00			
Balance brought forward from 1932 appropriation to cover 1932 expenditures on 1933 books	46,776.54			
		\$886,256.54	\$849,041.30	
			452.66*	
				\$36,762.58
<i>Specials:</i>				
Purchase of Boilers, 1932:				
Chapter 170, Acts of 1932	\$40,000.00			
Expended to Dec. 1, 1932	21,203.72			
		\$18,796.28	\$18,477.10	\$319.18
<i>Additional Pumping Equipment, 1931:</i>				
Chapter 245, Acts of 1931	\$50,000.00			
Chapter 170, Acts of 1932	50,000.00			
		\$100,000.00		
Expended to Dec. 1, 1932	76,294.46			
		\$23,705.54		
Chapter 174, Acts of 1933	50,000.00			
		\$73,705.54	\$49,023.82	\$24,681.72
<i>Improvements, Supply Mains, etc.</i>				
Chapter 245, Acts of 1931	\$400,000.00			
Chapter 170, Acts of 1932	350,000.00			
		\$750,000.00		
Expended to Dec. 1, 1932	558,704.20			
		\$191,295.80		
Chapter 174, Acts of 1933	250,000.00			
		\$441,295.80	\$274,397.00	\$166,898.80

*Resolve 28, Acts of 1933

Analysis of 1933 Receipts

PARKS DIVISION

Credited to:

Metropolitan Parks Const. Fund, Series I, Interest Fund	.	.	.	\$59.18
Metropolitan Parks Const. Fund, Series II, Interest Fund	.	.	.	35.01
Metropolitan Parks Expense Fund	.	.	.	95,154.53
Charles River Basin Maintenance Fund	.	.	.	41.06
Metropolitan Parks Maintenance Fund, General	.	.	.	38,131.18
Metropolitan Parks Maintenance Fund, Boulevards	.	.	.	651.13
General Revenue	.	.	.	2,759.30
				<hr/>
				\$136,831.39

SEWERAGE DIVISION

Credited to:
M. A. H.

Metropolitan Sewerage Sinking Fund, North System	.	.	.	.	\$210.00
Metropolitan Sewerage Maintenance Fund, North System	.	.	.	.	6,754.51
Metropolitan Sewerage Maintenance Fund, South System	.	.	.	.	6,769.62
Metropolitan Sewerage Interest Fund, North System	.	.	.	.	28.04
Metropolitan Sewerage Interest Fund, South System	.	.	.	.	34.03
					\$13,796.20

WATER DIVISION

Credited to:

Metropolitan Water Loan Interest Fund	.	.	.	.	.	\$96.07
Metropolitan Water Construction Fund	.	.	.	.	.	355.38
Metropolitan Water Sinking Fund	.	.	.	.	.	131,224.49
Metropolitan Water Maintenance Fund	.	.	.	.	.	14,947.52

APPENDIX NO. 1

CONTRACTS MADE AND PENDING DURING

Contract Number	WORK	Number of Bids	Lowest
199 ¹	Construction of Hammond Pond Parkway, Boylston Street to Beacon Street, Newton, and bridge over the Boston and Albany Railroad	9	\$123,386.50
200 ¹	Constructing roadway in Charles River Reservation, North Beacon Street to Western Avenue, Boston (Brighton District)	15	72,736.50
201 ¹ ²	Construction of proposed bathing beach between Mystic River and Riverside Avenue on easterly bank of "Labor-in-Vain," Medford	10	17,742.00
202 ¹	Excavating, filling, grading, surfacing and shore protection, Charles River Basin, between the Dam and Longfellow Bridge, and for breakwater opposite Pinckney Street, Boston	6	20,935.00
203 ¹ ²	Bath house between Mystic River and Riverside Avenue on easterly bank of "Labor-in-Vain," Medford	33	8,215.00
204	Excavation, filling, grading, surfacing, shore protection, boat landings and concrete and granite masonry overlooks and bridges, Charlesgate East to Mt. Vernon Street, Charles River Basin in Boston	11	152,063.00
205 ²	Excavation, filling, grading, loaming, gravel walkways, shore protection and boat landing, Cottage Farm Bridge to Charlesgate West, Charles River Basin in Boston and Brighton	11	48,978.50
206 ¹ ²	Resurfacing North Beacon Street Bridge over the Charles River, Boston and Watertown	19	6,814.85
207 ¹	Resurfacing Mystic Valley Parkway, Boston Avenue to Auburn Street, Somerville and Medford	11	7,829.00
208 ¹	Resurfacing Fellsway East, westerly roadway, Highland Avenue to Savin Street, Malden	9	9,294.50
209 ¹	Resurfacing Lynn Fells Parkway from Tremont Street to Melrose Street, Melrose	6	16,144.00
210 ¹ ²	Shore protection, Nahant Beach Parkway	13	16,425.00
211	Resurfacing Blue Hill River Road from a point 4,300 feet easterly from Hillside Street to Randolph Avenue, Milton and Quincy	11	25,275.00
212 ¹	Reconstructing Soldiers Field Road from Station 42 to Station 66, Boston	8	11,407.00
213 ¹	Reconstructing Mystic Valley Parkway from Highland Avenue to Middlesex Fells Reservation, Winchester	8	3,457.50
214 ¹	Reconstructing Ravine Road from Fellsway East to Melrose-Stoneham line, Stoneham	8	3,839.75
215 ²	Building bridge over the Mystic River in Medford	13	293,833.00
216 ¹	Constructing portion of traffic circle at junction of Brook Farm Parkway and West Roxbury Parkway	1*	8,822.00
217 ¹	Resurfacing inbound roadway of Fellsway West from Salem Street, Medford, to Wicklow Street, Malden	6	4,887.50

^{*}Work done in conjunction with work of City of Boston¹Work completed²Second lowest bid

APPENDIX NO. 1

THE YEAR 1933 — PARKS DIVISION

Contractor	Date of Contract	Date of Completion	Value of Work done Dec. 31, 1933
M. McDonough Co.	Jan. 26, 1933	—	\$181,706.08
M. McDonough Co.	Jan. 13, 1933	Aug. 28, 1933	83,605.58
M. McDonough Co.	Mar. 30, 1933	Aug. 10, 1933	30,438.06
Coleman Bros., Inc.	Mar. 30, 1933	Oct. 28, 1933	28,484.34
Tenaglia Construction Co.	Mar. 30, 1933	July 20, 1933	10,999.79
Coleman Bros., Inc.	May 11, 1933	—	206,293.59
Coleman Bros., Inc.	May 25, 1933	—	87,113.93
John P. Condon Corp.	June 15, 1933	Aug. 7, 1933	7,927.35
M. McDonough Co.	June 22, 1933	July 29, 1933	7,814.08
M. McDonough Co.	July 6, 1933	Aug. 21, 1933	10,271.79
M. McDonough Co.	July 13, 1933	Aug. 28, 1933	18,280.87
A. G. Tomasello & Son, Inc.	July 13, 1933	Aug. 31, 1933	21,828.31
C. & R. Construction Co.	July 13, 1933	Dec. 9, 1933	42,590.34
M. McDonough Co.	Sept. 21, 1933	Oct. 28, 1933	17,885.76
M. McDonough Co.	Sept. 28, 1933	Nov. 5, 1933	3,804.24
A. G. Tomasello & Son, Inc.	Sept. 28, 1933	Oct. 21, 1933	4,357.61
Coleman Bros. Corp.	Nov. 2, 1933	—	20,700.00
C. J. Maney Co., Inc.	Sept. 28, 1933	Nov. 21, 1933	10,605.68
G. Rotondi & Son	Oct. 26, 1933	Nov. 27, 1933	4,614.60

APPENDIX NO. 2

CONTRACTS MADE AND PENDING DURING

1 Number of Contract	2 WORK	3 Number of Bids	AMOUNT OF BID		6 Contractor
			4 Next to Lowest	5 Lowest	
83 ¹	Furnishing and laying 60-inch electric-welded steel water pipes in Newton and Watertown.	10	\$121,860.00	\$121,455.00 ²	Thomas Joseph McCue Watertown, Mass.
84 ¹	Pumping units for Chestnut Hill Pumping Station No. 1 in Boston.	6	66,753.00	64,199.00 ²	Warren Steam Pump Co., Inc., Warren, Mass.
90 ¹	Furnishing 2,100 tons cement lined bell and spigot cast-iron water pipes, 16 tons cement-lined flexible joint pipes and 53 tons special castings	3	85,982.50 ²	85,660.40	Warren Foundry & Pipe Corp., Boston
91 ¹	Laying 20-inch cast-iron water pipes furnished by the Commonwealth, in Revere	23	11,942.00 ²	10,426.00	A. Grande, Boston.
92	Furnishing and laying water pipes in Meford	9	106,255.50	105,130.00 ²	Cenedella & Co., Milford, Mass.
93 ¹	Furnishing water valves: 12 12-inch, 12 16-inch, 6 24-inch and 18 36-inch screw lift valves.	4	42,006.00 ² (2% discount for payment in 10 days from date of Eng. estimate.)	41,868.00	The Chapman Valve Mfg. Co., Indian Orchard, Mass.
94	Furnishing electric welded steel water pipes with rolled steel flanges	1	-	11,233.45 ²	Walsh Holyoke Steam Boiler Works, Inc., Holyoke, Mass.
95	Laying 20-inch cast-iron water pipes, furnished by the Commonwealth, in Lynn	15	12,650.50	10,497.50 ²	C. Reppucci & Co., Boston

¹Contract completed.²Contract based upon this bid.³Small balance remains unpaid.

APPENDIX NO. 2

THE YEAR 1933 — WATER DIVISION

7 Date of Contract	8 Date of Completion of Contract	9 Prices of Principal Items of Contract	10 Value of Work done Dec. 31, 1933
June 2, 1931	-	See Annual Report for 1932.	\$138,031.30 ^a
Jan. 20, 1932	Dec. 12, 1933	See Annual Report for 1932.	67,834.99
Feb. 14, 1933	Aug. 8, 1933	For 20-inch cement-lined bell and spigot pipes, Class C, \$37.50 per ton of 2,000 lbs.; for 20-inch cement-lined flexible joint pipes, Class D, \$57.50 per ton of 2,000 lbs.; for bell and spigot special castings, \$105.00 per ton of 2,000 lbs.; for flanged special castings, \$137.50 per ton of 2,000 lbs.	87,789.78
Mar. 28, 1933	July 19, 1933	For laying 20-inch cast-iron pipes, \$0.95 per lin. ft.; for rock excavation \$12.50 per cu. yd.; for chambers for 20-inch gate valves, \$60.00 per chamber; for chambers for connection, blow-off and air valves, \$43.00 per chamber; for resurfacing sheet asphalt and Bituminous Macadam streets, \$1.10 per sq. yd., for resurfacing granolithic sidewalks and concrete drives and gutters, \$0.99 per sq. yard.	15,212.20
July 22, 1933	-	For furnishing and laying 60-inch electric-welded steel pipe, \$16.30 per lin. ft.; for laying 36-inch cast-iron pipe, furnished by the Commonwealth, \$10.00 per lin. ft.; for laying 16-inch cast-iron pipe, furnished by the Commonwealth, for blow-offs, \$4.00 per lin. ft.; for laying 6-inch cast-iron pipe, furnished by the Commonwealth, for air vents, \$1.00 per lin. ft.; for rock excavation above or below established grade, \$1.00 per cu. yd.; for earth excavation below established grade, \$1.00 per cu. yd.; for chambers, for 36-inch gate valves, \$150.00 per chamber; for chambers for blow-off and by-pass valves, \$125.00 per chamber; for chambers for air valves and manholes, \$50.00 per chamber; for concrete masonry for foundations, anchorages and support for pipes \$5.75 per cu. yd.; additional for railroad crossing, \$3,700; additional for river and brook crossings, \$5,000; for resurfacing Bituminous Macadam, Warrenite and other pavements and brick and granolithic walks and driveways, \$2.00 per sq. yd.	90,992.00
July 10, 1933	Dec. 30, 1933	For 12-inch screw lift valves, \$278.00; for 16-inch valves, \$350.00; for 24-inch valves, \$660.00; for 36-inch valves, \$1,695.00 per valve.	41,741.45
July 18, 1933	-	For 20-inch electric-welded steel water pipes with rolled steel flanges, \$6.25 per lin. ft.; for 24-inch, \$6.95 per lin. ft.; for 30-inch, \$9.90 per lin. ft.	4,535.00
Sept. 8, 1933	-	For laying 20-inch cast-iron pipes, \$0.87 per lin. ft.; for rock excavation, \$10.00 per cu. yd.; for chambers for 20-inch gate valves, \$100.00 per chamber; for chambers for blow-off and air valves, \$65.00 per chamber; for concrete masonry for foundations for chambers and backing for curves, \$10.00 per cu. yd.; for resurfacing grouted granite block pavement on concrete base, including flagstone crossings, \$1.25 per sq. yd.; for sheet asphalt surface coat, \$1.55 per sq. yd.; for resurfacing granolithic sidewalks and concrete and cold patch driveways, \$1.20 per sq. yd.	15,739.24

CONTRACTS MADE AND PENDING DURING

1 Number of Contract	2 WORK	3 Number of Bids	AMOUNT OF BID		6 Contractor
			4 Next to Lowest	5 Lowest	
96 ¹	Furnishing a boiler feed pump for Chestnut Hill Pumping Station No. 1 in Boston	4 ⁴	—	\$1,252.00 ²	Warren Steam Pump Co., Inc., Warren, Mass.
97 ¹	Furnishing feed water heater for Chestnut Hill Pumping Station No. 1 in Boston	6 ⁵	\$820.80 ²	772.00	Cochrane Steam Specialty Company, Boston
35-M	Sale and purchase of electric energy to be developed at Wachusett Dam in Clinton	— ³	— ³	— ³	New England Power Co. and Edison Electric Illuminating Co. of Boston.
36-M	Sale and purchase of electric energy to be developed at Sudbury Dam in Southborough.	— ³	— ³	— ³	Edison Electric Illuminating Company of Boston.
56-M	Furnishing fuel oil burning equipment at Chestnut Hill Pumping Stations in Boston.	7	12,980.00 ²	12,422.00	Peabody Engineering Corp., New York, N. Y.
57-M ¹	Non-heat-conducting covering for 4 boilers at Chestnut Hill Pumping Stations.	6	1,675.00	1,670.00 ²	P. S. Thorsen Company of Massachusetts, Boston.
59-M ¹	Furnishing and installing flexible stay bolts in boilers at Chestnut Hill Pumping Stations in Boston.	6	7,818.00	7,245.00 ²	D. M. Dillon Steam Boiler Works, Fitchburg, Mass.
60-M ¹	Relaying water pipes under Neponset River in Hyde Park.	9	3,456.00	3,200.00 ²	L. P. Federico & Son, Boston.
61-M ¹	Painting steel tanks and other steelwork at Bellevue Reservoir in West Roxbury, and Forbes Hill Reservoir in Quincy.	11	1,486.00	1,190.00 ²	Louis P. Steensen, Boston.
62-M ¹	Furnishing temperature recorders for Chestnut Hill Pumping Stations, Boston.	— ³	— ³	— ³	Bailey Meter Co., Cleveland, Ohio.
63-M ¹	Furnishing draft gages and recorders for Chestnut Hill Pumping Stations in Boston.	— ³	— ³	— ³	Bailey Meter Co., Cleveland, Ohio.
64-M	Furnishing and erecting fences at Spot Pond in Stoneham.	13	14,787.55	14,729.10 ²	West End Iron Works, Cambridge, Mass.
65-M	Installing new tubes in boilers Nos. 15 and 16 at Chestnut Hill Pumping Station No. 2 in Boston.	6	3,674.00	3,275.00 ²	The Hodge Boiler Works East Boston, Mass.

¹Contract completed.²Contract based upon this bid.³Competitive bids were not received.⁴Three of the bids not in accordance with specifications.⁵Two of the bids not in accordance with specifications.

THE YEAR 1933 — WATER DIVISION — Continued

7	8	9	10
Date of Contract	Date of Completion of Contract	Prices of Principal Items of Contract	Value of Work done Dec. 31, 1933
Nov. 4, 1933	Dec. 30, 1933	For furnishing a boiler feed pump, \$1,252.00.	\$1,252.00
Nov. 10, 1933	Dec. 30, 1933	For feed water heater complete, \$820.80.	820.80
Mar. 1, 1929	—	Sale and purchase to include on week days, excepting Saturday afternoons and legal holidays, all electricity generated after deduction of that used by Commission in connection with operation of its works in Wachusett Section. Contract to continue until terminated by either party by giving 6 months' notice, but not earlier than March 1, 1939.	226,620.63
Mar. 1, 1929	—	Sale and purchase to include all electricity generated after deduction of that used by Commission in connection with operation of its Sudbury Power Station. Contract to continue for 10 years.	138,132.65
Oct. 4, 1932	—	See Annual Report for 1932.	11,352.00
Sept. 14, 1932	Feb. 6, 1933	See Annual Report for 1932.	1,849.00
Nov. 7, 1932	Apr. 18, 1933	See Annual Report for 1932.	7,332.00
Nov. 17, 1932	Jan. 23, 1933	See Annual Report for 1932.	3,190.80
Apr. 17, 1933	June 13, 1933	For painting steel water tank and other steelwork at Bellevue Reservoir, \$680.00; at Forbes Hill Reservoir, \$510.00.	1,190.00
Apr. 4, 1933	May 17, 1933	For one Bailey Temperature Recorder, Type K5, Class 55, with 2 recorders to record the flue gas temperature entering and leaving the economizer at Station No. 1, complete as specified, \$210.00; for one Bailey Temperature Recorder, Type K5, Class 555, with 3 recorders to record the flue gas temperature entering and leaving both economizers at Station No. 2, \$355.00.	565.00
Jan. 13, 1933	Feb. 28, 1933	For eleven Bailey Draft Gages, Type P1, \$550, and two Bailey Draft Recorders, Type K3, Class 1111, \$300, discount 5 per cent.	814.66
Nov. 14, 1933	—	For furnishing and erecting picket fence, including seven gates, \$1.58 per lin. ft.; for furnishing and erecting chain link fence, including one gate, \$1.64 per lin. ft	3,610.00
Dec. 8, 1933	—	For retubing boilers, Nos. 15 and 16, at Chestnut Hill Pumping Station No. 2, using No. 12 gage seamless boiler tubes, \$3,275.00.	—

APPENDIX NO. 3

TABLE NO. 1.—*Monthly Rainfall in inches at Various Places on the Metropolitan Water Works, 1933*

TABLE No. 2.—Rainfall in Inches at Chestnut Hill Reservoir, 1933

DATE	AMOUNT	DURATION	DATE	AMOUNT	DURATION
Jan. 7 . .	.10	11.45 A.M. to 2.15 P.M.	Apr. 1 . .	.10	7.00 A.M. to 12.00 M.
Jan. 9 . .	.96 ¹	8.30 A.M. to 11.30 P.M.	Apr. 1 . .	.22	10.20 P.M. to 5.15 A.M.
Jan. 11 . .	.16	9.30 P.M. to 3.30 A.M.	Apr. 2 . .		
Jan. 12 . .		3.30 A.M.	Apr. 3 . .	1.18	3.00 P.M. to 6.20 P.M.
Jan. 14 . .	.02 ²	9.00 A.M. to 7.00 A.M.	Apr. 4 . .		
Jan. 15 . .		7.00 A.M.	Apr. 6 . .	.47	8.30 P.M. to 5.30 P.M.
Jan. 19 . .	.45	7.30 A.M. to 3.10 P.M.	Apr. 7 . .		
Jan. 22 . .	.47	10.10 A.M. to 12.00 Mid	Apr. 12 . .	2.33 ¹	12.15 A.M. to 5.00 P.M.
Jan. 26 . .	.05	3.50 A.M. to 7.00 A.M.	Apr. 13 . .		
Jan. 26 . .		6.00 P.M. to 10.00 A.M.	Apr. 14 . .	.13	5.30 A.M. to 10.00 A.M.
Jan. 28 . .	.16 ¹		Apr. 15 . .		
Total . .	2.37		Apr. 16 . .	.01	4.45 A.M. to 5.00 A.M.
Feb. 1 . .	.18	7.10 P.M. to 3.45 A.M.	Apr. 17 . .	.02	3.35 A.M. to 4.40 A.M.
Feb. 2 . .		5.20 P.M. to 4.15 A.M.	Apr. 17 . .	1.02	10.00 A.M. to 7.00 A.M.
Feb. 4 . .	.13 ²		Apr. 18 . .		
Feb. 5 . .		7.15 P.M. to 7.10 A.M.	Apr. 18 . .	.54	8.30 A.M. to 7.30 A.M.
Feb. 7 . .	.59		Apr. 19 . .		
Feb. 8 . .		8.00 P.M. to 12.30 A.M.	Apr. 25 . .	.14	4.50 P.M. to 6.30 P.M.
Feb. 9 . .	.05		Apr. 26 . .	.11	9.00 A.M. to 2.00 P.M.
Feb. 11 . .	1.09 ²	3.40 A.M. to 1.30 P.M.	Total . .	6.27	
Feb. 14 . .	.04	10.15 A.M. to 2.00 P.M.	May 3 . .	.01	7.15 P.M. to 7.30 P.M.
Feb. 15 . .	.07	8.10 A.M. to 10.00 A.M.	May 9 . .	.57	10.50 P.M. to 12.00 M.
Feb. 20 . .	.99	5.50 A.M. to 10.00 P.M.	May 10 . .		
Feb. 23 . .	.07	7.30 A.M. to 10.00 A.M.	May 20 . .	1.02	7.45 P.M. to 11.30 A.M.
Feb. 25 . .	.120 ²	2.45 P.M. to 5.00 P.M.	May 21 . .		
Feb. 26 . .			May 24 . .	.05	1.00 P.M. to 3.30 P.M.
Total . .	4.41		May 26 . .	.01	11.30 P.M. to 7.15 A.M.
Mar. 1 . .	1.32 ¹	10.00 A.M. to 11.15 P.M.	May 27 . .		
Mar. 3 . .		2.45 P.M. to 6.00 P.M.	May 28 . .	.05	3.00 A.M. to 7.30 A.M.
Mar. 7 . .	2.16		May 30 . .	.67	8.00 A.M. to 12.00 M.
Mar. 8 . .		3.25 A.M. to 9.00 A.M.	May 31 . .	.52	1.40 A.M. to 5.00 P.M.
Mar. 13 . .	.04 ¹	5.00 P.M. to 2.15 P.M.	Total . .	2.90	
Mar. 13 . .	.78	3.00 P.M. to 12.00 Mid	June 4 . .	.04	4.15 A.M. to 5.30 A.M.
Mar. 15 . .		9.00 A.M. to 8.15 P.M.	June 6 . .	.16	4.30 A.M. to 8.00 A.M.
Mar. 19 . .	.19 ²	8.25 A.M. to 3.45 P.M.	June 9 . .		7.10 P.M. to 8.45 P.M.
Mar. 20 . .	1.14 ¹	2.00 P.M. to 4.35 A.M.	June 9 . .	.38	11.30 P.M. to 3.00 A.M.
Mar. 21 . .		8.50 P.M. to 7.00 A.M.	June 10 . .		
Mar. 26 . .	.03 ¹		June 13 . .	.08	2.30 A.M. to 5.00 A.M.
Mar. 28 . .	.41 ¹		June 17 . .	.08	5.20 P.M. to 6.40 P.M.
Mar. 29 . .			June 18 . .	.09	12.30 P.M. to 7.30 P.M.
Mar. 31 . .	.55		June 21 . .	.31	6.20 A.M. to 7.15 A.M.
Apr. 1 . .			June 21 . .	.03	9.00 A.M. to 11.30 A.M.
Total . .	6.62		June 22 . .	.66	12.30 A.M. to 4.30 A.M.
			Total . .	1.83	

¹Rain and Snow²Snow

TABLE NO. 2.—Rainfall in Inches at Chestnut Hill Reservoir, 1933
Concluded

DATE	AMOUNT	DURATION	DATE	AMOUNT	DURATION
July 4 . .	.32	9.15 P.M. to 10.00 P.M.	Oct. 1 . .	.08	10.50 P.M. to 5.30 A.M.
July 5 . .	.36	6.30 P.M. to 3.15 A.M.	Oct. 2 . .	.69	8.45 A.M. to 7.00 A.M.
July 8 . .			Oct. 5 . .		
July 9 . .			Oct. 6 . .		
July 10 . .	.46	5.25 P.M. to 1.30 A.M.	Oct. 7 . .	.42	4.15 P.M. to 2.45 A.M.
July 11 . .			Oct. 8 . .		
July 20 . .	.64	10.30 P.M. to 2.30 A.M.	Oct. 9 . .	1.02	8.10 P.M. to 2.50 A.M.
July 21 . .	.03	7.00 A.M. to 9.00 A.M.	Oct. 10 . .	.08	4.10 A.M. to 8.30 A.M.
July 24 . .	.03	11.00 P.M. to 12.00 Mid	Oct. 13 . .		
July 25 . .	.16	11.00 A.M. to 11.30 P.M.	Oct. 17 . .	.12	10.30 A.M. to 7.30 P.M.
July 31 . .	.04	3.45 A.M. to 3.55 A.M.	Oct. 18 . .	.01	6.30 P.M. to 7.00 P.M.
Total . .	2.04		Oct. 23 . .	.01	7.45 A.M. to 9.00 A.M.
			Oct. 24 . .	1.18	11.45 A.M. to 2.45 A.M.
			Oct. 25 . .		
Aug. 1 . .	.03	6.45 P.M. to 7.00 P.M.	Total . .	3.61	
Aug. 4 . .	.71	2.00 A.M. to 1.00 P.M.			
Aug. 5 . .	.07	5.55 P.M. to 6.25 P.M.	Nov. 6 . .	.10 ¹	3.30 A.M. to 11.30 P.M.
Aug. 8 . .	.39	4.05 P.M. to 8.30 P.M.	Nov. 8 . .	.10	7.30 A.M. to 10.00 A.M.
Aug. 11 . .	.02	9.00 P.M. to 9.00 A.M.	Nov. 11 . .	.24 ²	7.00 P.M. to 2.00 A.M.
Aug. 12 . .			Nov. 12 . .		
Aug. 14 . .	.02	11.00 A.M. to 3.00 P.M.	Nov. 14 . .	.11	4.00 A.M. to 7.30 A.M.
Aug. 17 . .	.02	11.30 A.M. to 2.30 P.M.	Nov. 17 . .	.08 ²	8.40 P.M. to 12.00 Mid
Aug. 18 . .	.01	3.30 P.M. to 7.00 P.M.	Nov. 18 . .	.02	7.00 P.M. to 9.00 P.M.
Aug. 20 . .	.05	12.40 A.M. to 4.30 P.M.	Nov. 26 . .	.26	7.00 P.M. to 4.00 A.M.
Aug. 21 . .	.69	11.45 A.M. to 7.00 A.M.	Nov. 27 . .		
Aug. 22 . .			Nov. 29 . .	.05	9.00 P.M. to 12.45 A.M.
Aug. 23 . .	.68	12.00 M. to 7.00 A.M.	Nov. 30 . .		
Aug. 24 . .			Total . .	.96	
Aug. 28 . .	.58	5.20 P.M. to 6.30 A.M.			
Aug. 29 . .			Dec. 3 . .	.03	4.20 A.M. to 7.30 A.M.
Total . .	3.27		Dec. 3 . .	.41 ¹	11.45 P.M. to 6.30 P.M.
Sept. 3 . .	1.88	5.30 P.M. to 2.50 P.M.	Dec. 4 . .		
Sept. 4 . .			Dec. 5 . .	.27	9.00 P.M. to 4.20 P.M.
Sept. 6 . .	.63	3.45 P.M. to 4.45 A.M.	Dec. 6 . .		
Sept. 7 . .			Dec. 9 . .	.02	2.00 P.M. to 8.30 P.M.
Sept. 9 . .	.03	1.30 A.M. to 5.00 A.M.	Dec. 13 . .	.34 ²	12.30 P.M. to 8.30 A.M.
Sept. 10 . .	.02	10.00 A.M. to 10.20 A.M.	Dec. 14 . .		
Sept. 14 . .	.19	5.00 A.M. to 7.00 A.M.	Dec. 15 . .	.35	11.45 A.M. to 3.30 A.M.
Sept. 15 . .			Dec. 16 . .		
Sept. 15 . .	7.91	5.15 P.M. to 11.05 P.M.	Dec. 17 . .	.22	6.15 P.M. to 1.15 A.M.
Sept. 17 . .			Dec. 20 . .	1.15	2.30 P.M. to 3.20 A.M.
Sept. 20 . .	.01	10.15 A.M. to 10.30 A.M.	Dec. 21 . .		
Sept. 20 . .	.02	9.40 P.M. to 11.45 P.M.	Dec. 26 . .	.69 ²	9.30 A.M. to 11.00 P.M.
Sept. 21 . .	.03	6.15 P.M. to 6.35 P.M.	Total . .	3.48	
Sept. 25 . .	.04	2.55 A.M. to 3.20 A.M.			
Sept. 26 . .	.07	2.20 A.M. to 2.20 A.M.			
Sept. 27 . .					
Sept. 27 . .	.02	7.45 P.M. to 8.10 P.M.			
Sept. 28 . .					
Sept. 28 . .	.07	6.25 A.M. to 7.00 A.M.			
Sept. 29 . .					
Total . .	10.92	5.15 A.M. to 11.00 A.M.			

Total for Year 48.68 inches.

¹Rain.

²Snow.

TABLE NO. 3.—Wachusett System—Statistics of Flow of Water, Storage and Rainfall in 1933

(Watershed above dam = 108.84 square miles)

Month	Taken by Clinton and Worcester	Received from Ware River Watershed	Received ¹ from City of Worcester Watershed	Discharged into Wachusett Aqueduct ²	GALLONS PER DAY			Rainfall Collected (Inches)	Percent-age of Rainfall Collected		
					STORAGE ⁴		Total Yield of Watershed				
					Gain	Loss					
January	-	-	4,958,000	144,110,000	974,000	9,855,000	141,761,000	2.71	85.8		
February	-	-	9,436,000	121,243,000	975,000	51,418,000	165,957,000	4.78	2.457		
March	-	-	20,419,000	159,397,000	92,867,000	52,542,000	285,384,000	5.92	51.4		
April	-	-	46,568,000	140,946,000	387,883,000	43,063,000	17,126,000	6.39	4.677		
May	-	-	5,113,000	126,226,000	13,497,000	-	83,170,000	4,089,000	79.0		
June	-	-	-	125,543,000	3,437,000	1,000,000	122,919,000	2.58	130.5		
July	-	-	-	144,700,000	1,716,000	968,000	-	430,000	1.942		
August	-	-	-	142,126,000	1,716,000	919,000	-	225,000	0.742		
September	-	-	-	98,869,000	1,704,000	899,000	88,704,000	316,000	38.5		
October	-	-	-	111,78,000	1,719,000	900,000	-	25,110,000	0.401		
November	-	-	-	87,870,000	1,723,000	907,000	-	25,340,000	18.6		
December.	-	-	-	117,177,000	1,700,000	900,000	-	35,093,000	0.465		
Total.	-	-	-	7,136,000	126,852,000	43,127,000	953,000	-	12.0		
Avg. for Yr.	-	-	-	-	-	-	16,895,000	146,901,000	0.020		
								1,350,000	27.8		
								50.97	55.6		
								28.347			

¹Received from City of Worcester watershed, not included in Wachusett watershed yield.

²Including 213,000 gallons per day drawn from aqueduct for the supply of the Westborough State Hospital.

³Estimated

⁴Aggregate storage in Wachusett Reservoir and in ponds and mill reservoirs.

TABLE No. 4.—*Sudbury System—Statistics of Flow of Water, Storage and Rainfall in 1939*

(Watershed = 75.2 square miles)

Month	Water* received from Wachusett Reservoir	GALLONS PER DAY						Rain-fall Collected (Inches)	Percent-age of Rainfall Collected		
		Water discharged through Sudbury Aqueduct	Water used by Framingham Water Works	Water diverted from Water-shed by Sewers, etc.	STORAGE		Yield per Square Mile				
					Water wasted into River below Lowest Dam	Gain	Total Yield of Watershed				
January	143,913,000	12,716,000	110,213,000	1,387,000	—	83,074,000	14,016,000	78,174,000	1,854		
February	121,043,000	16,321,000	106,061,000	1,368,000	—	77,950,000	—	9,521,000	2.36		
March	159,187,000	96,665,000	14,006,000	1,371,000	1,548,000	313,000	249,181,000	71,832,000	4.09		
April	140,742,000	9,493,000	99,121,000	1,235,000	2,307,000	1,002,000	309,203,000	2,941,000	1,539		
May	126,010,000	11,903,000	109,719,000	1,297,000	594,000	—	41,574,000	3,673,000	5.65		
June	125,320,000	15,180,000	116,383,000	1,413,000	237,000	—	13,533,000	54,787,000	729,000		
July	144,463,000	13,697,000	110,694,000	1,387,000	197,000	—	3,606,000	8,923,000	119,000		
August	141,890,000	14,261,000	114,852,000	1,413,000	184,000	—	1,932,000	6,203,000	1,47		
September	98,643,000	11,783,000	105,397,000	1,385,000	952,000	—	61,278,000	10,003,000	115,000		
October	111,574,000	10,284,000	111,829,000	1,445,000	861,000	—	33,158,000	5,790,000	40,13,000		
November	87,670,000	8,717,000	109,770,000	1,433,000	514,000	—	22,380,000	24,967,000	30,177,000		
December	116,974,000	10,742,030	114,632,000	1,439,000	455,000	—	34,648,000	748,000	45,690,000		
Total Av. for Yr.	126,639,000	12,406,000	108,813,000	1,381,000	766,000	109,000	77,333,000	950,000	—		
								75,119,000	999,000		
								47.24	20,980		
									44.4		

* Not including 213,000 gallons per day drawn from the Wachusett Aqueduct for the supply of the Westborough State Hospital, not discharged into Sudbury Reservoir.

TABLE No. 5.—*Cochituate System—Statistics of Flow of Water, Storage and Rainfall in 1933*

(Watershed of Lake = 17.58 Square Miles*)

MONTH	Water discharged through Cochituate Aqueduct	Water diverted from Watershed by Sewers, etc.	Water wasted at Outlet of Lake	GALLONS PER DAY			Rainfall Collected (Inches)	Percent-age of Rainfall Collected		
				STORAGE		Total Yield of Watershed				
				GAIN	LOSS					
January	—	—	1,068,000	16,868,000	—	19,613,000	1,116,000	84.0		
February	—	—	1,122,000	24,264,000	—	24,204,000	1,377,000	2.218		
March	—	—	2,851,000	60,323,000	—	63,145,000	3,592,000	7.54		
April	—	—	3,268,000	61,585,000	—	63,782,000	3,628,000	6.19		
May	—	—	1,123,000	13,077,000	—	15,419,000	877,000	2.38		
June	—	—	533,000	6,980,000	—	4,990,000	284,000	1.20		
July	—	—	213,000	—	—	1,255,000	71,000	.490		
August	—	—	64,000	—	—	1,158,000	66,000	7.1		
September	—	—	603,000	26,540,000	—	24,686,000	1,404,000	3.4		
October	—	—	429,000	9,503,000	694,000	10,626,000	604,000	2.427		
November	—	—	340,000	8,623,000	—	7,913,000	450,000	33.9		
December	—	—	345,000	15,549,000	—	2,113,000	784,000	63.7		
Total	—	—	993,000	20,177,000	—	370,000	20,800,000	34.3		
Average for year	—	—	—	—	—	—	—	51.6		

*Not including the Watersheds of Dudley and Dug Pond.

TABLE No. 6.—Sources from which and Periods during which Water has been drawn for the Supply of the Metropolitan Water District From Wachusett Reservoir into the Wachusett Aqueduct

MONTH	Number of Days during which Water was Flowing	ACTUAL TIME		Million* Gallons Drawn
		Hours	Minutes	
January	25	305	39	4,467.4
February	22	230	36	3,394.8
March	27	333	45	4,941.3
April	24	285	26	4,222.5
May	26	268	50	3,913.0
June	26	259	50	3,766.3
July	25	305	25	4,485.7
August	26	302	08	4,405.9
September	21	202	32	2,970.2
October	25	237	25	3,465.2
November	24	180	59	2,636.1
December	25	247	30	3,632.5
Totals	296	131.670 days		46,300.9

*Including quantity supplied Westborough State Hospital.

From Sudbury Reservoir through the Weston Aqueduct to Weston Reservoir

MONTH	Number of Days during which Water was Flowing	ACTUAL TIME		Million Gallons Drawn
		Hours	Minutes	
January	31	744	00	3,416.6
February	28	656	00	2,969.7
March	31	706	30	2,996.6
April	30	682	07	2,969.5
May	31	739	28	3,401.3
June	30	717	30	3,491.5
July	31	736	00	3,431.5
August	31	743	47	3,560.4
September	30	706	30	3,166.3
October	31	742	45	3,466.7
November	30	713	00	3,293.1
December	31	742	00	3,553.6
Total	365	359.567 days		39,716.8

From Framingham Reservoir No. 3 through Sudbury Aqueduct to Chestnut Hill Reservoir

MONTH	Number of Days during which Water was Flowing	ACTUAL TIME		Million Gallons Drawn
		Hours	Minutes	
January	31	744	-	394.2
February	28	672	-	457.0
March	31	744	-	434.2
April	30	719*	-	284.4
May	31	744	-	369.0
June	30	720	-	455.4
July	31	744	-	424.6
August	31	744	-	442.1
September	30	721*	-	354.0
October	31	744	-	318.8
November	30	720	-	261.5
December	31	744	-	333.0
Total	365	365 days		4,528.2

*Daylight saving change.

TABLE No. 7.—*Average Daily Quantity of Water flowing through Aqueducts in 1933 by Months*

MONTH	Wachusett Aqueduct into Sudbury Reservoir (Gallons)	Weston Aqueduct into Metropolitan District (Gallons)	Sudbury Aqueduct into Chestnut Hill Reservoir (Gallons)	Cochituate Aqueduct into Chestnut Hill Reservoir (Gallons)
January	143,913,000	110,213,000	12,716,000	-
February	121,043,000	106,061,000	16,321,000	-
March	159,187,000	96,665,000	14,006,000	-
April	140,742,000	99,121,000	9,493,000	-
May	126,010,000	109,719,000	11,903,000	-
June	125,320,000	116,383,000	15,180,000	-
July	144,465,000	110,694,000	13,697,000	-
August	141,890,000	114,852,000	14,261,000	-
September	98,643,000	105,397,000	11,784,000	-
October	111,574,000	111,829,000	10,284,000	-
November	87,670,000	109,770,000	8,717,000	-
December	116,974,000	114,632,000	10,742,000	-
Average.	126,639,000	108,813,000	12,406,000	-

TABLE No. 8.—(Meter Basis). Average Daily Consumption of Water by Districts in the Cities and Towns supplied by the Metropolitan Water Works in 1933

MONTH	LOW SERVICE	SOUTHERN HIGH SERVICE	SOUTHERN INTERMEDIATE HIGH SERVICE	NORTHERN HIGH SERVICE	NORTHERN EXTRA HIGH SERVICE	Lexington and Portions of Arlington and Belmont (Gallons)	Total District Supplied (Gallons)	Estimated Population	Con- sumption per In- habitant (Gallons)
		Melrose, Nahant, Revere, Stoneham, Swampscott and Winthrop and Portions of Boston, Chelsea, Everett, Malden, Medford and Somerville (Gallons)	Portions of Boston and Milton and Watertown (Gallons)	Portions of Belmont and Watertown (Gallons)	Melrose, Nahant, Revere, Stoneham, Swampscott and Winthrop and Portions of Boston, Chelsea, Everett, Malden, Medford and Somerville (Gallons)				
January	65,216,600	45,462,300	1,406,900	11,535,500	1,356,200	1,403,800	126,381,300	1,430,310	88
February	64,437,400	43,992,800	1,378,100	11,569,100	1,364,700	1,420,200	124,162,300	1,431,670	87
March	62,736,100	42,107,000	1,389,700	11,473,400	1,324,200	1,401,200	120,431,600	1,433,020	84
April	61,160,700	42,138,000	1,404,400	11,487,400	1,342,600	1,427,100	118,960,200	1,434,380	83
May	62,593,300	42,765,400	1,535,000	12,315,200	1,562,300	1,850,400	122,621,600	1,435,730	85
June	66,596,400	45,366,400	1,701,800	13,425,100	1,668,100	2,346,800	131,104,600	1,437,090	91
July	63,657,000	44,765,700	1,678,200	12,754,800	1,701,500	2,226,200	127,782,000	1,438,440	89
August	64,801,700	45,463,300	1,556,900	13,481,300	1,602,200	2,103,800	129,009,200	1,439,800	90
September	64,210,300	45,262,600	1,436,800	12,608,000	1,627,500	1,881,200	127,026,400	1,441,150	88
October	63,338,800	44,003,500	1,379,200	12,047,900	1,549,000	1,845,000	124,163,400	1,442,510	86
November	62,181,800	43,109,200	1,417,600	11,897,900	1,521,100	2,002,700	122,090,300	1,443,860	85
December	65,133,300	45,094,400	1,349,800	11,832,200	1,536,100	2,085,200	127,031,000	1,445,220	88
For the year	63,833,700	44,130,300	1,470,100	12,290,700	1,513,900	1,835,300	125,074,000	1,438,440	87

TABLE NO. 9.—(Meter Basis). Average Daily Consumption of Water in Cities and Towns supplied by the Metropolitan Water Works in 1933

City or town	Population	ARLINGTON		BELMONT		BOSTON		CHELSEA		EVERETT		LEXINGTON		MALDEN	
		Per Day	Per Capita	Per Day	Per Capita	Per Day	Per Capita	Per Day	Per Capita	Per Day	Per Capita	Per Day	Per Capita	Per Day	Per Capita
MONTH															
January	42,260	1,789,300	43	1,331,000	54	86,324,300	110	3,333,200	70	4,350,300	85	518,200	50	3,380,800	55
February		1,792,100	43	1,302,500	52	84,032,400	107	3,354,200	71	4,382,600	85	510,300	50	3,412,200	55
March		1,770,900	43	1,316,300	53	80,827,200	103	3,318,500	70	4,326,200	84	531,200	51	3,303,300	53
April		1,766,200	42	1,368,400	55	79,624,700	102	3,418,300	72	4,053,500	79	546,400	53	3,285,500	53
May		2,056,000	49	1,567,600	62	80,307,800	103	3,480,100	73	4,129,100	80	703,300	68	3,437,500	55
June		2,522,400	60	1,841,200	73	84,879,100	108	3,586,700	75	4,320,000	83	856,900	82	3,692,200	59
July		2,467,400	58	1,785,400	70	82,089,600	105	3,470,600	73	4,322,500	83	788,200	76	3,705,900	59
August		2,338,000	55	1,590,500	63	84,152,700	107	3,339,100	70	4,507,100	87	709,800	68	3,839,400	61
September		2,176,800	51	1,339,300	53	84,767,500	108	3,209,700	67	4,425,500	85	615,500	59	3,831,500	61
October		2,122,900	50	1,283,700	50	82,871,900	106	3,150,100	66	4,344,100	83	601,000	57	3,608,900	58
November		2,293,500	53	1,292,800	50	80,788,200	103	3,196,600	67	4,246,800	81	595,900	57	3,497,100	56
December		2,332,800	54	1,235,500	48	85,361,100	109	3,222,700	67	4,264,600	81	566,700	54	3,618,400	58
For the year		2,120,900	50	1,438,700	57	82,999,100	106	3,339,700	70	4,305,900	83	629,400	60	3,551,900	57

TABLE No. 9.—(Meter Basis.) Average Daily Consumption of Water in Cities and Towns, etc.,—Continued.

City or town	MEDFORD	MELROSE	MILTON	NAHANT	REVERE	
					Population	66,730
MONTH	GALLONS		GALLONS		GALLONS	
	Per Capita	Per Day	Per Capita	Per Day	Per Capita	Per Day
January	3,207,700	49	1,401,800	57	819,200	45
February	3,235,400	49	1,384,500	56	809,500	44
March	3,227,600	49	1,406,600	57	808,200	44
April	3,232,100	49	1,444,900	58	810,200	44
May	3,307,600	50	1,571,800	63	957,000	52
June	3,495,400	53	1,782,000	72	1,013,000	54
July	3,353,300	50	1,676,600	67	958,600	51
August	3,353,500	50	1,536,700	62	924,800	49
September	3,110,000	46	1,443,300	58	937,900	50
October	3,052,400	45	1,417,800	57	854,100	45
November	3,040,100	45	1,478,700	59	870,000	46
December	3,050,500	45	1,591,600	63	844,000	45
For the year	3,222,000	48	1,512,200	61	884,200	47
					206,600	123
						65
						54

REVERE

QUINCY

NAHANT

MILTON

MELROSE

MEDFORD

GALLONS

REVERE

TABLE No. 9.—(Meter Basis.) *Average Daily Consumption of Water in Cities and Towns, etc.,—(Concluded.)*

City or Town	Population	SOMERVILLE		STONEHAM		SWAMPTSCOTT		WATERTOWN		WINTHROP		METROPOLITAN DISTRICT	
		Per Day	Per Capita	Per Day	Per Capita	Per Day	Per Capita	Per Day	Per Capita	Per Day	Per Capita	Per Day	Per Capita
SOMERVILLE	107,660	10,520	11,070	39,350	11,070	17,440	11,070	17,440	11,070	17,440	1,438,440	1,438,440	
MONTH		Per Day	Per Capita	Per Day	Per Capita	Per Day	Per Capita	Per Day	Per Capita	Per Day	Per Capita	Per Day	Per Capita
January	· · · · ·	8,382,500	78	778,200	74	654,600	60	1,915,000	49	1,019,100	59	126,381,300	88
February	· · · · ·	8,327,700	78	760,700	73	664,100	63	1,982,100	51	1,051,500	61	124,162,300	87
March	· · · · ·	8,142,500	76	750,700	72	689,600	63	1,882,800	48	1,001,700	58	120,431,600	84
April	· · · · ·	7,917,400	74	734,100	70	719,600	65	1,939,400	50	1,011,300	58	118,960,200	83
May	· · · · ·	8,622,100	80	804,700	77	837,800	76	2,167,300	55	1,149,200	66	122,621,600	85
June	· · · · ·	9,400,500	87	869,000	83	974,100	88	2,457,900	63	1,351,300	78	131,104,600	91
July	· · · · ·	9,186,100	85	945,000	90	1,062,200	96	2,472,200	63	1,467,900	84	127,782,400	89
August	· · · · ·	9,278,400	86	941,000	89	1,071,200	97	2,539,700	64	1,467,600	84	129,009,200	90
September	· · · · ·	8,743,300	81	886,200	84	794,900	72	2,337,600	59	1,296,800	74	127,026,400	88
October	· · · · ·	8,927,700	83	879,400	83	670,500	60	2,136,900	54	1,173,100	67	124,163,400	86
November	· · · · ·	8,642,300	80	901,700	85	606,500	54	2,165,900	64	1,122,900	64	122,090,300	85
December	· · · · ·	9,066,500	84	727,300	69	626,300	56	2,212,000	55	1,009,200	58	127,031,000	88
For the year	· · · · ·	8,723,500	81	831,900	79	782,000	71	2,186,500	56	1,177,600	68	125,074,000	87

TABLE No. 10.—Chemical Examinations of Water from the Wachusett Reservoir, Clinton—1933.

Parts per 1,000,000

DATE OF COLLECTION	APPEARANCE	ODOR	RESIDUE ON EVAPORATION				Chlorine Content	Hardness		
			ALBUMINOID		AMMONIA					
			Total	Free	Dissolved	Suspended				
Jan. 4.	V. slight.	V. faintly vegetable.	35.0	10.0	.006	.054	.046	2.5		
Jan. 17.	V. slight.	V. faintly vegetable.	37.5	12.5	.004	.072	.018	16		
Feb. 1.	V. slight.	V. faintly vegetable.	42.0	18.0	.012	.076	.002	2.6		
Feb. 14.	V. slight.	V. faintly vegetable.	42.0	12.0	.010	.082	.066	16		
Mar. 8.	V. slight.	V. faintly vegetable.	35.0	12.0	.008	.096	.016	2.8		
Mar. 22.	V. slight.	V. faintly vegetable.	30.0	10.0	.002	.066	.030	16		
Apr. 5.	V. slight.	V. faintly vegetable.	38.5	13.0	.010	.128	.018	2.6		
Apr. 18.	V. slight.	V. faintly vegetable.	38.0	14.5	.006	.092	.022	16		
May 3.	V. slight.	V. faintly vegetable.	38.0	14.5	.004	.068	.028	2.5		
May 17.	V. slight.	V. faintly vegetable.	38.0	16.0	.008	.152	.036	17		
June 7.	V. slight.	V. faintly vegetable.	35.0	11.5	.012	.078	.100	10		
June 21.	V. slight.	V. faintly vegetable.	38.0	15.0	.006	.078	.022	2.9		
July 5.	V. slight.	V. faintly vegetable.	34.5	11.5	.036	.120	.022	16		
July 19.	V. slight.	V. faintly vegetable.	—	—	.022	.126	.044	2.5		
Aug. 2.	V. slight.	V. faintly vegetable.	32.5	14.0	.008	.084	.022	14		
Aug. 16.	V. slight.	V. faintly vegetable.	34.5	12.0	.020	.066	.032	17		
Sept. 6.	V. slight.	V. faintly vegetable.	41.0	15.5	.004	.110	.018	10		
Sept. 20.	V. slight.	V. faintly vegetable.	33.5	11.5	.026	.078	.022	2.7		
Oct. 4.	V. slight.	V. faintly vegetable.	34.5	10.5	.026	.072	.020	13		
Oct. 18.	V. slight.	V. faintly vegetable.	37.5	11.5	.032	.136	.060	17		
Nov. 1.	V. slight.	V. faintly vegetable.	33.0	10.0	.008	.078	.024	16		
Dec. 6.	V. slight.	V. faintly vegetable.	36.5	13.5	.006	.084	.022	13		
Dec. 20.	V. slight.	V. faintly vegetable.	38.0	13.5	.010	.072	.008	2.8		
Average	.....	.....	36.4	12.8	.012	.094	.027	1.5

TABLE No. 11.—*Chemical Examinations of Water from the Sudbury Reservoir—1933*
Parts per 1,000,000

TABLE No. 12.—*Chemical Examinations of Water from Spot Pond, Stoneham, 1933*

TABLE No. 13.—*Chemical Examinations of Water from Lake Cochituate—(1933)*
[Parts per 1,000,000]

DATE OF COLLECTION	APPEARANCE	ODOR	RESIDUE ON EVAPORATION		AMMONIA		Chlorine Suspended	Chlorine Dissolved	ALBUMINOID	Hardness
			Loss on Ignition		Total	Free				
			Cold	Hot	Total	Loss on Ignition				
Jan. 4.	Turbidity	Sediment	V. slight.	V. slight.	88.5	17.0	.110	.096	.020	10.8
Feb. 1.	Turbidity	Sediment	V. slight.	V. slight.	90.0	21.0	.062	.126	.024	9.6
Mar. 8.	Turbidity	Sediment	V. slight.	V. slight.	88.0	21.0	.032	.114	.088	8.6
Apr. 5.	Turbidity	Sediment	V. slight.	V. slight.	85.5	27.0	.268	.140	.102	33
June 7.	Turbidity	Sediment	V. slight.	V. slight.	76.0	21.5	.152	.156	.116	34
Aug. 2.	Turbidity	Sediment	V. slight.	V. slight.	72.5	22.5	.048	.140	.028	34
Oct. 2.	Turbidity	Sediment	V. slight.	V. slight.	75.0	16.5	.032	.132	.098	30
Nov. 1.	Turbidity	Sediment	V. slight.	V. slight.	75.0	21.0	.020	.134	.098	30
Dec. 7.	Turbidity	Sediment	V. slight.	V. slight.	76.0	22.5	.060	.170	.116	30
Average					81.3	21.2	.087	.136	.103	32

TABLE NO. 14.—*Chemical Examinations of Water from a tap at the State House, Boston—1933*

TABLE No. 15. — *Chemical Examinations of Water from a Faucet in Boston, 1898–1933*

Parts per 1,000,000

Year	Color Platinum Standard	RESIDUE ON EVAPORATION		AMMONIA			Chlorine	Oxygen Consumed	Hardness		
		Total	Loss on Ignition	ALBUNIMOID							
				Free	Total	Dis-solved	Sus-pended				
1898 . . .	40	41.9	16.0	.008	.152	.136	.016	2.9	4.4	14	
1899 . . .	28	37.0	13.0	.006	.136	.122	.014	2.4	3.5	11	
1900 . . .	29	38.0	12.0	.012	.157	.139	.018	2.5	3.8	13	
1901 . . .	29	44.3	16.4	.013	.158	.142	.016	3.0	4.2	17	
1902 . . .	30	39.3	15.6	.016	.139	.119	.020	2.9	4.0	17	
1903 . . .	29	39.8	15.0	.013	.125	.110	.015	3.0	3.9	15	
1904 . . .	23	39.3	15.9	.023	.139	.121	.018	3.4	3.7	15	
1905 . . .	24	38.6	15.9	.020	.145	.124	.021	3.5	3.5	14	
1906 . . .	24	38.6	13.9	.018	.159	.134	.025	3.4	3.6	13	
1907 . . .	22	38.3	14.0	.013	.129	.109	.020	3.3	3.2	13	
1908 . . .	19	35.0	13.5	.011	.115	.092	.024	3.3	2.6	12	
1909 . . .	18	34.6	14.3	.011	.128	.103	.025	2.8	2.5	13	
1910 . . .	14	30.5	12.4	.013	.118	.102	.016	2.8	2.2	11	
1911 . . .	25	41.8	16.6	.015	.156	.128	.029	3.8	3.3	14	
1912 . . .	17	38.6	12.3	.018	.154	.119	.034	3.6	2.9	17	
1913 . . .	13	39.6	11.5	.014	.150	.120	.026	3.5	2.6	15	
1914 . . .	14	41.2	11.9	.014	.138	.116	.022	3.9	2.5	14	
1915 . . .	16	37.3	10.4	.015	.157	.134	.023	3.8	2.5	14	
1916 . . .	18	45.3	18.5	.013	.133	.107	.026	3.6	—	14	
1917 . . .	15	44.5	16.8	.015	.142	.124	.018	3.3	—	13	
1918 . . .	18	38.9	14.5	.019	.154	.128	.026	2.9	—	14	
1919 . . .	20	42.8	14.1	.010	.130	.108	.022	3.6	—	15	
1920 . . .	17	42.3	13.5	.012	.112	.097	.014	3.3	—	15	
1921 . . .	13	38.0	13.9	.006	.104	.089	.015	2.5	—	14	
1922 . . .	16	39.8	15.5	.011	.097	.080	.017	3.0	—	18	
1923 . . .	15	39.0	14.5	.011	.100	.090	.010	2.6	—	15	
1924 . . .	12	41.0	16.0	.011	.109	.084	.025	2.8	—	15	
1925 . . .	9	39.8	16.2	.013	.109	.093	.016	2.9	—	15	
1926 . . .	10	41.8	16.8	.015	.115	.092	.023	3.2	—	15	
1927 . . .	22	44.7	16.2	.013	.111	.101	.018	3.4	—	19	
1928 . . .	27	44.3	17.2	.011	.124	.106	.018	3.7	—	15	
1929 . . .	21	42.6	17.1	.007	.106	.074	.032	3.0	—	13	
1930 . . .	16	40.7	13.4	.012	.071	.055	.016	3.4	—	13	
1931 . . .	24	48.8	16.4	.013	.097	.072	.025	4.5	—	20	
1932 . . .	19	43.5	16.0	.007	.102	.075	.027	3.9	—	16	
1933 . . .	19	41.5	14.1	.010	.095	.069	.026	4.0	—	19	

TABLE No. 16.—Number of Bacteria per Cubic Centimeter in Water from Various Parts of the Metropolitan Water Works, 1898–1933. (Averages of Weekly Determinations.)

YEAR	CHESTNUT HILL RESERVOIR			SOUTHERN SERVICE TAPS	
	Sudbury Aqueduct Terminal Chamber	Cochituate Aqueduct	Effluent Gate House No. 2	Low Service 182 Boylston Street	High Service 20 Somerset Street
1898	207	145	111	96	—
1899	224	104	217	117	123
1900	248	113	256	188	181
1901	225	149	169	162	168
1902	203	168	121	164	246
1903	76	120	96	126	243
1904	347	172	220	176	355
1905	495	396	489	231	442
1906	231	145	246	154	261
1907	147	246	118	130	176
1908	162	138	137	136	148
1909	198	229	119	150	195
1910	216	—	180	178	213
1911	205	204	151	175	197
1912	429	450	227	249	259
1913	123	243	157	119	140
1914	288	—	252	174	220
1915	163	—	128	117	134
1916	128	—	85	102	105
1917	178	112	119	119	141
1918	1,163	168	705	317	544
1919	92	85	100	70	84
1920	148	86	108	113	112
1921	103	—	83	92	92
1922	163	—	153	160	172
1923	229	—	178	217	230
1924	137	—	96	150	160
1925	144	251	120	155	174
1926	167	—	118	130	137
1927	119	185	70	81	101
1928	144	32	86	106	106
1929	128	—	84	130	144
1930	107	—	66	105	123
1931	82 ¹	4 ¹	43	80	101
1932	121 ¹	—	63	123	147
1933	20 ¹	—	15	40	45

¹After the water was sterilized with chlorine.

TABLE NO. 17.—Colors of Water from Various Parts of the Metropolitan Water Works in 1933. (*Averages of Weekly Determinations.*)

MONTH	WACHSUETT RESERVOIR	SUDSBURY RESERVOIR	LAKE COCHITAUATE	CHESTNUT HILL RESERVOIR	SPOT POND	FELLS RESER- VOIR	NORTHERN SERVICE	SOUTHERN SERVICE	BOSTON HIGH SERVICE
									TAP AT 182 BOSTON ST.
January	17	17	31	26	27	-	21	28	26
February	17	17	32	26	21	-	20	21	21
March	18	17	29	33	-	20	-	20	20
April	19	19	25	32	24	22	38	34	21
May	19	19	28	50	43	23	22	21	21
June	19	19	30	66	49	22	22	23	22
July	16	17	19	44	25	18	17	19	17
August	15	15	16	18	40	23	15	16	15
September	15	15	15	17	76	59	13	12	10
October	16	15	17	22	72	50	19	18	10
November	15	15	15	25	56	38	20	16	10
December	16	17	16	36	51	37	20	-	18
Mean	17	17	25	49	35	21	19	19	13
						25	27	20	13
						25	27	19	13
						25	27	19	13

TABLE No. 18.—Temperatures of Water from Various Parts of the Metropolitan Water Works in 1933. (Averages of Weekly Determinations.)

(The temperatures are taken at the same places and times as the samples for microscopical examination, the depth at place of observations from high water mark.
[Degrees Fahrenheit])

MONTH	WACHUSETT ¹ RESERVOIR DEPTH AT PLACE OF OBSERVATION 107 FEET	SUDSBURY ¹ RESERVOIR DEPTH AT PLACE OF OBSERVATION 54.5 FEET	WACHU- SETT AQUE- DUCT	FRAMINGHAM ¹ RESERVOIR NO. 3 DEPTH AT PLACE OF OBSERVATION 20.5 FEET	LAKE COCHITIATE 1 DEPTH AT PLACE OF OBSERVATION 62.0 FEET			CHEST- NUT HILL RESER- VOIR			SPOT POND DEPTH AT PLACE OF OBSERVATION 28.0 FEET			NORTHERN SERVICE			
					Bottom	Mid-depth	Surface	Bottom	Mid-depth	Surface	Bottom	Mid-depth	Surface	Bottom	Mid-depth	Surface	
January .	36.6	—	34.2	36.6	—	—	34.8	35.8	—	—	36.9	37.1	37.2	—	34.8	34.9	39.4
February .	33.4	33.4	34.0	34.5	33.8	35.6	—	33.8	35.6	—	38.2	—	35.5	33.5	34.3	39.4	39.9
March .	34.0	34.1	34.6	36.7	—	—	34.3	35.4	—	—	37.3	36.3	36.0	33.5	34.6	38.9	38.2
April .	39.2	37.2	39.8	44.0	44.5	43.0	41.1	44.6	47.5	44.5	44.9	42.1	45.0	42.1	40.5	39.6	39.1
May .	54.6	50.6	47.6	50.6	47.2	54.3	50.1	61.0	60.4	59.8	61.1	50.0	46.8	58.1	57.0	43.3	39.0
June .	68.9	—	48.6	69.5	60.2	—	54.0	70.0	68.0	—	70.8	52.8	46.3	68.5	67.0	56.8	59.8
July .	71.7	60.1	51.0	72.0	68.3	62.8	55.0	70.3	71.0	68.8	70.9	53.5	47.5	70.7	72.3	72.0	70.6
August .	72.7	67.1	54.9	73.1	68.8	67.0	58.1	72.8	73.0	74.3	73.7	52.4	47.6	74.4	73.8	71.8	73.5
September .	65.7	62.4	57.1	64.0	62.0	64.0	56.8	61.9	—	62.0	65.7	52.9	47.5	64.3	64.8	64.5	66.2
October .	58.6	57.7	53.6	58.6	55.2	57.0	55.2	55.7	56.5	56.3	58.0	54.9	49.0	58.8	58.9	59.3	61.6
November .	44.8	47.0	46.5	43.5	47.3	45.0	45.0	39.9	45.3	—	45.4	44.8	45.7	42.9	41.5	44.5	46.9
December .	36.6	36.6	35.1	35.7	—	—	34.2	35.4	—	—	36.0	42.1	47.5	35.8	33.5	40.7	41.9
Mean .	51.4	48.6	44.8	52.3	58.0	56.2	46.0	51.5	60.2	61.0	53.2	47.3	44.8	52.5	53.0	47.9	53.9

¹Surface temperatures are averages of weekly determinations. Mid-depth and bottom temperatures are averages of bi-weekly determinations.

TABLE No. 19. — *Length of Metropolitan Water Works, Main Lines and Connections and Number of Valves set in Same, December 31, 1933*

[Pipes are of cast iron unless otherwise noted.]

	DIAMETER OF PIPES IN INCHES												Total					
	60	56	54	48	42	40	38	36	30	24	20	16	14	12	10	8	6	4
Total length owned and operated Dec. 31, 1932 (feet)	125,275	17,569	13,486	217,728	10,869	6,887	7,274	63,882	78,045	101,548	115,024	78,117	26	29,603	3,882	1,960	1,279	58
Gate valves in same	24	—	5	59	3	3	—	71	50	71	90	140	1	147	22	29	26	2
Air valves in same	181	8	12	132	6	5	6	48	47	60	76	41	—	1	—	—	—	633
Length laid or relaid during 1933 (feet)	3,755	—	—	117	—	17	—	183	55	182	16,471	1,809	—	368	—	—	—	22,957
Gate valves in same	—	—	—	1	—	—	—	6	—	1	—	—	—	8	1	—	—	23
Air valves in same	7	—	—	—	—	—	—	1	—	—	14	1	—	—	—	—	—	23
Length abandoned during 1933 (feet)	—	—	—	31	—	17	—	56	100	158	15	367	—	174	3,140	—	—	4,058
Gate valves in same	—	—	—	—	—	—	—	—	1	—	—	1	—	—	3	—	—	6
Air valves in same	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
Length owned and operated Dec. 31, 1933 (ft.)	129,030 ¹	17,569 ²	13,486 ³	217,814 ⁴	10,869 ⁴	6,887 ⁴	7,274 ²	64,009 ⁶	78,000 ⁶	101,572 ⁷	131,480 ⁸	79,559 ⁹	26	29,797 ¹⁰	742	1,960	1,279	58
Gate valves in same	24	—	5	60	3	3	—	77	49	71	96	139	1	155	20	29	26	760
Air valves in same	188	8	12	132	6	5	6	49	46	60	90	42	—	10	1	—	—	655

Includes 2,035 feet of 76-inch concrete-lined pressure tunnel; 363 feet of 76-inch mortar-lined and concrete-covered steel pipe; 21 feet of 76-inch cast-iron pipe; 85 feet of 60-inch concrete-covered steel pipe, and 81,475 feet of 60-inch steel pipe.

²Steel pipe.

³Includes 2,172 feet of steel pipe.

⁴Includes 1,059 feet of steel pipe.

⁵Includes 236 feet of steel pipe.

⁶Includes 15,512 feet of mortar-lined and covered wrought-iron pipe; 7,213 feet of cement-lined cast-iron pipe, and 19,101 feet of steel pipe.

⁷Includes 55 feet of steel pipe.

⁸Includes 17,790 feet of cement-lined cast-iron pipe.

⁹Includes 1,795 feet of cement-lined cast-iron pipe.

¹⁰Includes 627 feet of cement-lined cast-iron pipe.

1 4,688.83 miles.

TABLE NO. 20.—Length of Metropolitan Water Works Hydrant, Blow-off and Drain Pipes, December 31, 1933

[All pipes are of cast iron.]

	DIAMETER OF PIPES IN INCHES						Total		
	24	20	16	12	10	8	6	4	
Total length in use December 31, 1932 (feet)	352	292	4,106	7,459	220	1,315	4,524	1,663	19,931
Valves in same	-	-	57	126	2	20	111	48	364
Length laid or relaid in 1933 (feet)	-	-	8	20	-	-	-	-	161
Valves in same	-	-	1	1	-	-	-	-	189
Length abandoned in 1933 (feet)	-	-	-	-	-	-	-	-	7
Valves in same	-	-	-	-	-	-	-	-	-
Total length in use December 31, 1933 (feet)	352	292	4,114	7,479	220	1,315	4,524	1,824	20,120 ¹
Valves in same	-	-	58	127	2	20	111	53	371

¹3.81 miles.

TABLE No. 21.—Length of Metropolitan Water Works Main Lines and Connections and Water Pipes, Four Inches in Diameter
and Larger, in the Several Cities and Towns in the Metropolitan Water District, Dec. 31, 1933

BY WHOM OWNED	INCHES												TOTALS								
	60	56	54	48	42	40	38	36	30	24	20	18	16	14	12	10	8	6	4	Feet	Miles
Met. Water Wks.	129,030	17,569	13,486	217,814	10,869	6,887	7,274	64,009	78,000	101,572	131,480	—	79,559	26	29,797	742	1,960	1,279	58	891,411	168.83
Arlington	—	—	—	—	—	—	—	—	—	—	—	—	2,388	—	—	97,175	255,105	2,609	438,958	83.13	
Belmont	—	—	—	21,655	15,980	15,352	—	44,540	90,643	83,924	86,581	—	310,646	4,966	1,707,263	66,053	214,843	—	321,300	60.85	
Boston	—	—	—	—	—	—	—	—	10,007	27,292	—	20,527	12,880	—	454,236	1,112,174	1,049,821	73,277	5,070,758	960.37	
Brookline	—	—	—	—	—	—	—	—	—	—	—	—	63,985	85,909	105,060	276,849	31	602,540	114.12		
Chelsea	—	—	—	—	—	—	—	—	—	—	—	—	5,176	—	—	5,479	40,251	34,521	152,773	6,315	
Everett	—	—	—	—	—	—	—	—	—	—	—	—	6,948	6,619	—	8,306	47,749	34,332	175,937	25,476	
Lexington	—	—	—	—	—	—	—	—	—	—	—	—	2,610	—	—	40,775	14,224	66,834	192,969	27,890	
Malvern	—	—	—	—	—	—	—	—	—	—	—	—	8,891	11,121	—	97,909	38,474	119,413	237,865	46,380	
Medford	—	—	—	—	—	—	—	—	—	—	—	—	6,775	9,598	42,143	47,699	136,241	298,338	558,123	105.71	
Melrose	—	—	—	—	—	—	—	—	—	—	—	—	6,249	3,024	26,223	26,858	27,202	206,125	51,998	347,679	
Milton	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	73,406	23,989	
Nahant	—	—	—	—	—	—	—	—	—	—	—	—	4,551	72	—	—	—	—	—	427,202	8,330
Newton	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	423,724	80.05
Quincy	—	—	—	—	—	—	—	—	—	—	—	—	36,250	—	15,023	10,444	—	—	—	137,541	26.05
Revere	—	—	—	—	—	—	—	—	—	—	—	—	15,450	—	32,123	—	—	—	—	699,210	1,089,936
Somerville	—	—	—	—	—	—	—	—	—	—	—	—	5,577	367	10,600	7,416	97,805	249,237	451,520	64,712	
Stoneham	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	987,900	187.10	
Swampscott	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	365,826	69.29
Watertown	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Winthrop	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total feet	129,030	17,569	13,486	239,469	26,849	22,239	7,274	108,549	168,643	197,987	315,462	367	529,478	85,822	2,507,021	1,190,385	2,709,944	5,323,810	560,027	14,153,411	
Total miles	24.44	3.33	2.55	45.35	5.09	4.21	1.38	20.56	31.94	37.50	59.75	.07	100	28	16.25	474.81	225.45	513.25	1,008.30	106.07	2,680.57

TABLE NO. 22.—Number of Service Pipes, Meters, Per Cent of Services Metered, Fire Services and Fire Hydrants in the Several Cities and Towns in the Metropolitan Water District, December 31, 1933

CITY OR TOWN	Services	Meters	Per Cent of Services Metered	Services Used for Fire Purposes Only	Fire Hydrants
Arlington	7,324	7,324	100.00	32	860
Belmont	4,664	4,664	100.00	7	485
Boston	100,963	100,963	100.00	3,085	12,034
Chelsea	5,892	5,892	100.00	139	449
Everett	7,389	7,389	100.00	52	626
Lexington	2,528	2,528	100.00	16	509
Malden	9,767	9,767	100.00	76	735
Medford	10,811	10,811	100.00	34	1,061
Melrose	5,968	5,968	100.00	25	469
Milton	4,188	4,188	100.00	7	671
Nahant	919	919	100.00	2	144
Quincy	16,958	16,958	100.00	53	1,772
Revere	6,408	6,401	99.89	9	477
Somerville	14,093	13,936	98.89	123	1,398
Stoneham	2,413	2,411	99.92	3	189
Swampscott	2,739	2,739	100.00	5	287
Watertown	6,077	6,077	100.00	41	680
Winthrop	3,844	3,844	100.00	7	382
District Supplied	212,945	212,779	99.92	3,716	23,228
Brookline	7,839	7,834	99.94	44	1,055
Newton	14,808	14,808	100.00	100	1,585
Total District	235,592	235,421	99.93	3,860	25,868

TABLE No. 23.—Elevation of the Hydraulic Grade Line, in Feet, above Boston City Base for Each Month at Stations on Metropolitan Water Works during 1933

SOUTHERN HIGH SERVICE																		
		LOW SERVICE		MILTON, ADAMS STREET AT CANTON AVENUE		BOSTON, BOWDOIN SQUARE ENGINE HOUSE		CHELSEA COURT HOUSE										
1933 MONTH	WATER TOWN PLEASANT STREET AT WALTHAM LINE	BELMONT WATER WORKS SHOP, WAVER- LEY STREET		ALLSTON ENGINE HOUSE, HARVARD STREET		BOSTON, BOWDOIN SQUARE ENGINE HOUSE		SOMERVILLE PUBLIC LIBRARY, HIGHLAND AVENUE										
		Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum									
January .	198	193	194	183	176	168	152	141	179	166	164	157	158	158	144	245	226	218
February .	198	193	194	181	176	159	152	143	180	166	167	157	158	158	143	247	224	218
March .	196	193	187	176	178	159	152	143	176	168	164	153	155	158	143	247	228	218
April .	196	191	186	175	177	156	152	141	177	167	164	153	155	155	142	247	226	218
May .	198	192	194	162	172	163	152	141	175	167	165	165	156	156	143	245	221	214
June .	198	193	194	160	177	168	150	140	179	166	168	157	158	158	142	245	215	204
July .	198	191	194	160	176	167	149	138	177	164	169	155	165	156	142	242	216	207
August .	198	191	186	160	175	168	149	138	174	166	165	156	155	155	143	242	215	202
September .	198	193	190	176	172	166	152	141	171	164	164	155	156	156	143	249	219	234
October .	198	193	190	176	175	168	150	141	173	167	165	156	156	155	144	249	228	216
November .	198	193	187	176	177	168	152	141	171	166	171	157	165	158	144	249	228	211
December .	198	193	186	175	172	166	152	138	173	166	164	157	165	158	143	249	226	211
Averages .	198	192	190	172	175	165	151	140	175	166	166	156	165	157	143	246	223	212

TABLE NO. 23.—*Elevation of the Hydraulic Grade Line, in Feet, above Boston City Base, etc.—Concluded.*

MONTH	SOUTHERN HIGH SERVICE — Concluded		NORTHERN HIGH SERVICE		WINTHROP TOWN HALL, HERMAN STREET	
	QUINCY, FORBES HILL, TOWER		SOMERVILLE WATER WORKS SHOP		REVERE WATER WORKS SHOP, BROADWAY	
	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum
January	237	216	233	214	256	243
February	237	216	235	214	259	245
March	237	216	235	214	259	245
April	237	216	235	214	259	245
May	237	202	235	200	259	243
June	237	200	233	189	259	238
July	237	200	233	193	259	233
August	237	199	233	191	263	231
September	232	201	229	196	263	237
October	236	207	235	205	263	243
November	236	206	235	198	266	243
December	236	206	235	202	266	240
Averages	236	207	234	203	261	241
					267	248
					263	214
						197

¹Local standpipe out of service.

APPENDIX No. 4

CONTRACTS MADE AND PENDING DURING

Contracts relating to the

1 Number of Contract	2 WORK	3 Number of Bids	AMOUNT OF BID		6 Contractor
			4 Next to Lowest	5 Lowest	
1 66 ²	Removing two old and furnishing and placing two new vertical internally fired boilers at the Alewife Brook Pumping Station, Somerville.	3	\$3,138.00	\$2,947.00 ¹	International Engineering Works, Inc. Framingham.
2 67	Section 83 Mill Brook Valley Sewer, North Metropolitan System, in Arlington and Lexington.	17	10,454.00	9,987.95 ¹	Zoppo & Civitarese Co. Inc., Boston, Mass.

¹Contract based upon this bid.²Contract completed.

APPENDIX No. 4

THE YEAR 1933.—SEWERAGE DIVISION

North Metropolitan System

7 Date of Contract	8 Date of Completion of Work	9 Prices of Principal Items of Contracts made in 1933	10 Value of Work done Dec. 31, 1933
Apr. 13, 1933	Sept. 25, 1933	- - - - - - - - - -	\$2,947.00 1
July 13, 1933	-	For excavation and refilling in trench for 20" vitrified pipe main sewer and laying of pipe, \$1.53 per lin. ft.; for Portland cement brick masonry in manholes and special structures, \$20.00 per cu. yd.; for Portland cement concrete masonry in trench and special structures, \$6.00 per cu. yd.; for Portland cement boulder concrete masonry in trench, \$4.00 per cu. yd.; for rock excavation in trench, \$5.00 per cu. yd.	9,790.75 2
			\$12,737.75

APPENDIX No. 4

CONTRACTS MADE AND PENDING DURING THE

Contracts relating to the

1 Number of Contract	2 WORK	3 Number of Bids	AMOUNT OF BID		6 Contractor
			4 Next to Lowest	5 Lowest	
1 52 ²	Section 125, Braintree-Weymouth Sewer, South Metropolitan System, in Braintree and Weymouth.	8	\$105,325.90	\$100,951.00 ¹	George M. Bryne, Boston, Mass.
2 54 ²	Section 120, New Neponset Valley Sewer, South Metropolitan System, in Canton.	17	52,500.00 ¹	44,400.00	Anthony Baruffaldi, West Somerville, Mass.
3 56 ²	Section 121, New Neponset Valley Sewer, South Metropolitan System, in Canton and Stoughton.	19	53,871.00	53,023.00 ¹	V. Barletta Company, Boston, Mass.
4 59 ²	Quincy Pumping Station engine and centrifugal pump, South Metropolitan System in Quincy.	5	6,450.00	6,390.00 ¹	Turbine Equipment Co. of New England, Boston, Mass.
5 60 ²	Section 124, Braintree-Weymouth Sewer, South Metropolitan System, in Weymouth.	22	93,398.00 ¹	63,583.45	C. & R. Construction Company, Boston, Mass.
6 61 ²	Proposed pumping equipment, Braintree-Weymouth Pumping station, South Metropolitan System, in Quincy.	6	29,250.00	28,975.00 ¹	Turbine Equipment Co., of New Eng- land, Boston, Mass.
7 62 ²	Section 122, Braintree-Weymouth Sewer, South Metropolitan System, in Quincy.	21	78,790.00 ¹	64,920.00	A. D. Daddario, Boston, Mass.
8 63 ²	Braintree - Weymouth Pumping Station Substructure, So. Metropolitan System, Quincy.	15	17,300.00	16,385.00 ¹	Louis Balboni, Boston, Mass.
9 64 ²	Section 87, Extension of High - Level Sewer, South Metropolitan System in Brighton and Newton.	17	71,945.00	62,957.50 ¹	P. DeCristofaro, Boston, Mass.
10 65 ²	Braintree - Weymouth Pumping Station Building, So. Metropolitan System Quincy.	27	13,892.00	11,990.00 ¹	N. Spinelli & Sons, Co., Inc., Boston, Mass.
11 68	Riprap Reinforcement and valve manhole, Section 125, South Metropolitan System, Braintree.	5	1,362.00	650.00 ¹	A. C. Trojano, Brain- tree, Mass.

¹Contract based upon this bid.²Contract completed

APPENDIX No. 4

YEAR 1933 — SEWERAGE DIVISION. — Continued.

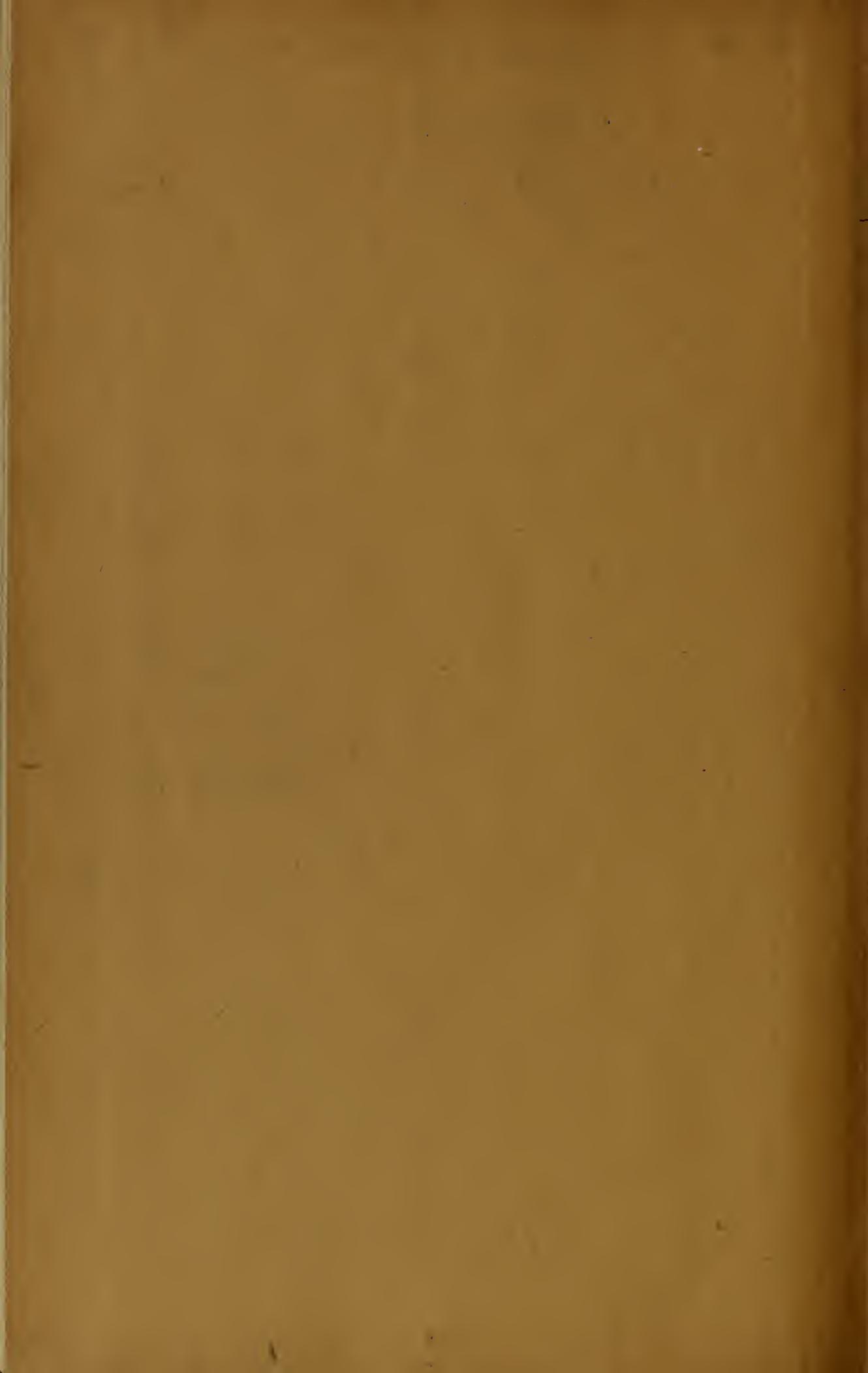
South Metropolitan System

7 Date of Contract	8 Date of Completion of Work	9 Prices of Principal Items of Contracts made in 1933	10 Value of Work done Dec. 31, 1933	
Nov. 5, 1931	Oct. 11, 1933	—	\$111,506.72	1
Dec. 10, 1931	Feb. 9, 1933	—	58,134.06	2
Mar. 31, 1932	Sept. 29, 1933	—	70,410.34	3
June 2, 1932	Jan. 26, 1933	—	7,390.00	4
July 21, 1932	Oct. 24, 1933	—	114,169.03	5
Aug. 18, 1932	Oct. 31, 1933	—	30,915.55	6
Oct. 27, 1932	Oct. 14, 1933	—	109,969.76	7
Jan. 5, 1933	Sept. 1, 1933	For excavation and refilling in pump-well and building and other foundations and roadway grading, lump sum, \$2,875; for earth excavation and refilling in trench and tunnel for 60" x 63" and 30" conc. sewer and 4" and 30" c.i. pipe, \$11.00 per lin. ft., for Portland cement brick masonry in trench and tunnel, for manholes and special structures, \$25.00 per cu. yd.; for Portland cement concrete masonry in sewer, pump-well, building, chimney, and engine foundations and floors, \$7.00 per cu. yd.; for steel reinforcing rods, beams, plates, etc., \$75.00 per ton; gravel for sub-surface of roadways, \$1.00 per cu. yd.	17,851.17	8
Dec. 29, 1932	Oct. 18, 1933	—	69,157.36	9
Apr. 27, 1933	Oct. 11, 1933	Lump sum.	11,977.00	10
Nov. 29, 1933	—	Lump sum.	—	11
			\$601,480.99	

CONTRACTS MADE AND PENDING DURING THE YEAR 1933 — SEWERAGE
DIVISION — Concluded.

Summary of Contracts.

	Value of Work done Dec. 31, 1933.
North Metropolitan System, 2 Contracts	\$12,737.75
South Metropolitan System, 11 Contracts	601,480.99
Total of 13 contracts made and pending during the year 1933	\$614,218.74



~~BK 660.23 [cont]~~

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